Describing being with a robot – “That’s AMoRE”

A study of how to describe the experience of being with a moving non–social robot

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Abstract

Robots can be perceived as tools, something almost alive and something in between. We found the perception of robots interesting and wanted to explore further what the experience of being with a robot can be. To investigate this, we formed our research questions: *Is there a way to describe the experience of being with a moving non-social robot?* and *How can the experience of being with a moving non-social robot be systematised?* In order to answer these questions, we have performed a multiple case study investigating the experience of being with robot vacuum cleaners, robot lawn mowers, and Boston Dynamics' Spot. Through our project, we have explored how we can understand and interpret people's descriptions of experience. The result is an analytical framework we have called Analytical Mapping of Robot Experience – AMoRE. We argue that this framework can be used to describe the experience of being with a robot once the experience is systemised by using AMoRE's four dimensions.

Keywords: *HRI, experience, robot vacuum cleaners, robot lawnmowers, Spot*

Abstrakt

Roboter kan bli oppfattet som verktøy, som noe tilnærmet levende og noe i mellom. Vi syns denne persepsjonen av roboter er interessant og ville utforske nærmere hva opplevelsen av å være med en robot kan være. For å utforske dette har vi utformet forskningsspørsmålene: *Finnes det en måte å beskrive opplevelsen av å være sammen med en bevegende ikke-sosial robot?* Og *Hvordan kan opplevelsen av å være med en bevegende ikke-sosial robot systematiseres*? For å svare på forskningsspørsmålene har vi gjennomført en case studie med to caser hvor vi har undersøkt opplevelsen av å være med robotstøvsugere, robotgressklippere og Boston Dynamics sin Spot. Gjennom prosjektet vårt har vi utforsket hvordan vi kan forstå og tolke personers beskrivelse av opplevelse. Resultatet er et analytisk rammeverk vi har kalt Analytisk Kartlegging av Robotopplevelse – AMoRE. Vi argumenterer for at dette rammeverket kan brukes til å beskrive opplevelsen av å være med roboter etter at opplevelsen er systematisert ved bruk av AMoRE's fire dimensjoner.

Nøkkelord: *HRI, opplevelse, robotstøvsuger, robotgressklipper, Spot*

PREFACE

During the subject ‘IN5480 – Specialisation in Research in Design of IT’ in the first year of our master’s degree, we decided to write about robots or AI. Associate professor Jo Herstad introduced us to the concepts ‘anthropomorphism’ and ‘zoomorphism’; we were intrigued. Little did we know that this curiosity would lead to us ‘meeting’ Freke and participating in a military demonstration.

During this process, we have been able to combine Tora’s passion for interaction and UX design, Runa’s curiosity for cognitive psychology, and our growing interest in Human-Robot interaction. We would argue both feel that our similarities and differences are visible in our finished master thesis and showcase who we are.

We owe a huge thanks to our main supervisor Rebekka Soma for guiding us in the right direction and somehow knowing where we were headed long before we did. We are also very grateful for our co-supervisor Tønnes Nygaard. We appreciate the opportunity to work with Freke and the introduction to FFI.

Furthermore, we want to thank all our lovely informants for participating and providing useful and entertaining insight into their experience with robots. This thesis would not have been possible without their contribution!

It has been enjoyable working on this project, and a big part of that is due to the great social and educational environment on the 7th floor of IFI. A special thanks to Niels Theissen for countless interesting and motivational discussions (and fastelavnsboller and cake).

In addition, we want to thank our friends and family for being there and cheering us on.

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CHAPTER 1: INTRODUCTION

1.1 OUR INTEREST

Both through our own experience, and literature, we find that it is possible to experience a mixed feeling; we know robots are technology, and still get an emotional reaction. For instance, watching a video of someone 'torturing' Pleo the robotic dinosaur can evoke emotions like distress (Rosenthal-von der Pütten et al., 2013) something we have experienced. We know that robots fundamentally are technological objects but can still view them as something else.

These conflicting perceptions are fascinating and were something we wanted to investigate. We believe it is important to understand how robots are experienced so that we can better predict the effects and potential consequences of an increase in the usage of robots in the military, in the industry, and the domestic context. In society, there seems to be a focus on automation and digitalisation and the economical benefits. We find ourselves wondering about the consequences and regulations, and the long-term effect of being with robots.

A great deal of previous research on Human-robot-interaction has been experimental research conducted in controlled environments (Darling, 2015; Rosenthal-von der Pütten et al., 2013; Seo et al., 2015; Sirkin et al., 2015). These experiments can indicate how we act when being with a robot, but do not go in-depth about what the experience is. Darling et al. (2015) for instance, found that people were significantly more hesitant to smash a robot bug with a background story, compared to when they did not hear a background story. The authors suggest that background stories can influence empathetic responses. We are curious about why the participants hesitated and how the experience of the robot could be described.

If a robot is experienced as something other than an object, this could perhaps intervene with the decisions making. Darling (2017) refers to a situation where a colonel stops the mine destruction done by a robot, because the action and its consequences were inhumane,

according to the colonel. This made us more curious about the perception of robots, and how this might affect how humans experience robots. We wonder if the perception of the robot is something other than an object, and the experience of the robot as something almost *alive* could lead to miscalculated risks due to conflicting thoughts. Being able to describe the perception and experience can help facilitate the desired experience.

1.2 RESEARCH QUESTION

We are curious about what people experience when they are with robots, as well as how the experience is conveyed. We wonder what the colonel experienced – what he was feeling and which associations he had – when he expressed that the incident with the mine-clearing robot was inhumane. More knowledge regarding what the colonel experienced, could perhaps be used to understand why he reacted the way he did as well as prevent similar situations. A way to describe experience may be the first step for regulating robot use and preventing unintentional consequences. This is what we want to investigate in this master thesis. Based on our interest we have formulated the following research question (RQ):

Is there a way to describe the experience of being with a moving non-social robot?

(RQ1)

Experience is subjective and can be difficult to describe. In order to describe the experience, we first have to systematise it. We believe categorisation would not be sufficient and would rather view the experience in relation to a theory-based system. Hence, we also need to address the following question:

How can the experience of being with a moving non-social robot be systematised?

(RQ2)

Both our research questions are primarily descriptive as we try to systematise and describe different experiences of being with moving non-social robots. We will not try to explain the reason for the experience, but rather try to describe its potential complexity. We do not seek to investigate the values in a social situation[1] or use an evaluation to investigate how a design could be better. This, according to Verne & Bratteteig's (2018) definitions, would make our research question normative or constructive.

As our research questions entail the human experience of robots more in general, we want to include non-users. We think 'everyone' in society is affected by robots since they are becoming a bigger part of everyday life, even for those who do not use robots but are close to robots. Hence, we are not just interested in the user experience of someone who interacts with or controls a robot. We believe anyone who can get an experience with the robot, could contribute when investigating our research question. In addition, we do not assume that one has to be physically close to a robot in order to have an experience with it. The experience can therefore be based on the perceptual experience of watching a film clip.

1.3 DEFINITIONS AND CLARIFICATIONS

During our master thesis, experience has been defined as "the content of a person's subjective knowledge and history, of external sensory influence (perception), emotional state (feelings), thought processes, motivation and more" (opplevelse 2020, translated from Norwegian by Tora and Runa). From our point of view, experience is not just how something is *perceived*, but also how people interpret their own emotions, thoughts, and motivation in that process. In addition to emotions, thought and motivation, we believe the interpretation of the context and one's role affects and becomes part of the experience. Hence, we view experience as a combination of many personal aspects which makes it subjective. For example, when on an apartment viewing, the experience of the apartment is probably much more than just how it looks. How the atmosphere feels, and how one imagines how it would be like to live there all constitute the experience of the apartment. We assume that experience is subjective and can

[1] Whether or not a robot is a social entity could be considered to be value laden as the value of being social is given by humans. However, this is not something we wish to go into.

be difficult to grasp and communicate. Another assumption we have made is that experience can be complex and has nuances.

We define a robot as "(...) a physical object that interacts with the physical environment, either on its own or via a person, to accomplish a task" (Schulz, 2020, p.3). We do not believe that robots need to be considered autonomous. The term autonomy refers to a robot's ability to adapt to changes in the environment (Thrun, 2004). It can also be defined as "the quality or state of being self-governing" (Merriam-Webster, n.d.) We interpret these two understandings of autonomy as an ability to adapt without human interference and supervision. It does not need to be dichotomous but could be talked about as degrees of autonomy.

We believe it is valuable to investigate robots that are not intentionally designed to be perceived as sociable. Such robots will hereafter be referred to as *non-social robots*. We imagine these are robots designed to be a part of human lives, without the creation of a social connection or relation. These could be robots such as a robotic coffee maker or a lawnmower. We find it interesting that a non-social robot – not intended to be perceived as inhabiting social attributes – still could be perceived as something social or inhabiting social attributes.

1.4 STRUCTURE

This thesis is structured as follow:

Chapter 2: Background as a theoretical foundation for our thesis and the theoretical context where we would place our contribution.

Chapter 3: Theoretical framework forms our theoretical lens for data collection, analysis and discussion. It also forms the basis for our analytical framework AMoRE, which is the contribution when answering our research question.

Chapter 4: Approach and methods explains our philosophical paradigm, choice of methodology, methods, and description of cases.

Chapter 5: Completion of the case study explains how we have executed the project.

Chapter 6: Analytical Mapping of Robot Experience presents the process of discovering our main finding– The framework AMoRE – and how we have used this to describe the experience of being with a robot in our two cases.

Chapter 7: Discussion is a discussion of how AMoRE can be used to answer the research questions, using theories and concepts from existing research. In addition, we present suggestions for further research.

Chapter 8: Critical reflection presents reflections over both our process and results.

Chapter 9: Conclusion sums up the process, results, and contributions.

1.5 FIGURES

1.6 TABLES

CHAPTER 2: BACKGROUND

This chapter goes through literature that forms the foundation for understanding where in the field of Human-Robot-Interaction (HRI) this project belongs. It is also meant to help the reader to follow our perspective and understanding of our research question. The chapter begins with chapter *2.1. Form*, where a definition of what 'form' in this context entails and why it can be important to focus on when facilitating an experience. In chapter *2.2 Psychological mechanisms* different theories from the field of psychology are presented, which can be helpful in order to understand how humans perceive robots. Chapter *2.3 Being with robots* presents perspectives on how human-robot-interaction and -cooperation can be viewed. Finally, in chapter *2.4 Ethical concerns with robot technology,* we will present a broader view of the potential consequences of using robot technology, to illustrate the importance of understanding and describing how using robots can affect humans.

2.1 FORM

2.1.1 DEFINITION OF FORM

The form of a social robot could affect the first impression, as well as influence how humans relate to them and thus experience them (Coeckelbergh, 2011b; Leite et al., 2013). The term *form* is seen as an expression of the whole robot, including the experience related to the interaction with the robot (DiSalvo et al., 2003). According to this definition, the form includes not only the physical shape or appearance, but the material used as well as behavioural characteristics such as movement. Referring to the views of DiSalvo et al. (2003), this knowledge is used to balance human needs, the characteristics of the technology, and the context of use, to support an activity or action.

2.1.2 THE IMPORTANCE OF FOCUSING ON FORM

The focus on a robot's form could for instance convey the robot's level of functionality, possibilities, and limitations (DiSalvo et al., 2003; Fong et al., 2003; Leite et al., 2013). This can help a user to understand what they are interacting with and shape their expectations. It is also argued that the appearance of a social robot should match the expectations of the user (Bartneck & Forlizzi, 2004; Duffy, 2003; Hegel et al., 2008; Löffler et al., 2020). This is

important because it can make it easier for the user to understand how the interaction occurs as well as limit unexpected consequences. For example, when seeing a small, round robot vacuum cleaner with no legs, you may expect that it can be difficult for it to climb the stairs.

One way of letting the user know of a robot's functionality is by giving hints (Kidd & Breazeal, 2008). This could be done by creating robots that resemble something familiar, like humans or animals. Giving a robot ears might give the user the impression that it has the functionality to 'hear' and it is possible to interact through voice and speech commands. For example, the robot Nao has microphones placed where ears normally would be for a human. Therefore, it can be natural to assume that the robot can 'hear' and expect it to understand speech.

However, it is a popular opinion in contemporary robotics that robots should not resemble something familiar (Turkle et al., 2006). This is because the expectations users get when seeing something familiar might be unrealistic and cause uneasiness. Paro, a therapeutic robotic baby seal, was given to residents at a nursing home to investigate how humans interact with robots (Turkle et al., 2006). The researchers explained the uneasiness the residents experienced because seals are not domesticated animals nor usually played with. They did not know exactly what to expect – if it would defend itself by biting or if it would like to be played with. During the research with Paro, it is evident how a familiar appearance might affect the experience of a robot.

2.1.3 MOVEMENT

As already mentioned, form includes how a robot moves. We believe that the movement could influence how a robot is perceived and experienced. In HRI, animation principles and techniques have been used to facilitate enhanced and more understandable interaction with robots. Schulz et al. (2018) explain that the usage of animation can make robots look more 'alive'. The usage of the animation principle *slow in, slow out* could for instance cause the robot to move less 'robot-like' and more 'natural'(Schulz et al., 2021). Takayama et al. (2011) also investigated the usage of animation principles by focusing on techniques for anticipation and reaction. They looked into how such techniques could be applied so that

humans could more easily understand and predict what robots were doing. Takayama et al. (2011) argue that a robot that showed forethought before acting would appear more appealing, approachable, and sure of its actions. According to them, this would be especially useful in situations where closeness is required during an interaction, to minimise the chance of the human getting hurt by the robot.

When talking about a robot's movement, Schulz et al. (2018) distinguish between *global movement* and *local movement.* Global movement refers to the physical movement, or motion, a robot might do. Local movement on the other hand refers to the moving parts of a robot while it is standing still. Both types of movements can be combined to describe how a robot is moving as well as explain what movement is possible for the robot to do. Both types of movements can be used to communicate information in addition to being functional.

Humans seem to interpret meaning into movement even though the movement is not intended to communicate anything. This became evident during an experiment with the robot Fetch described by Schulz et al. (2021). The robot in the experiment was instructed to move between navigation points within a room. When the instructions were received by Fetch, the robot would move its head up and down while it calculated the speed and path to travel. When the calculations were complete, the robot would straighten its head and proceed on the path. If there were trouble when calculating the path, the robot would continue moving its head up and down until the navigation succeeded or the software determined that Fetch was 'stuck'. If 'stuck', the recovery procedure would be initiated, and Fetch would rotate 360 degrees. The different movements were interpreted by the participants. Some experienced the recovery procedure as confusion, while others saw it as Fetch being thorough or cautious. There was also some speculation about Fetch's mood.

2.2 PSYCHOLOGICAL MECHANISMS

2.2.1 AUTOMATIC PERCEPTION

What people see when they observe a robot's form can be influenced by psychological mechanisms. One mechanism is automatic perception. In psychology, one speaks of different types of automatic cognition such as bottom-up attention and different principles that suggest the brain automatically interprets some stimuli in certain patterns. This type of interpretation is important to consider because it happens automatically and perhaps without our awareness. Sudden movement can capture attention in a bottom-up fashion where we instantly change focus without control (Bruce & Tsotsos, 2009). Humans can for instance quickly detect sudden movements even in their peripheral vision, which could help to be aware of dangerous situations.

In addition to spontaneous reactions, humans also try to understand by creating meaning based on very little information. Experiments have shown how moving geometrical shapes can lead to an interpretation of different meanings and causal effects. To understand how moving objects are perceived, researchers talk about different perceptual effects such as *perceptual causality* and *animacy* (Gao et al., 2009; Heider & Simmel, 1944; van Buren et al., 2017). Perceptual causality is when a moving object appears to move and stop near another object, and then the second object moves. This is perceived as the first object's movements are causing the second to move. As described by Michotte (referred in Wagemans et al., 2006) the perceptual effect causes us to see more than just two objects moving at certain times to certain locations.

Animacy is the perceptual effect when moving geometric figures are perceived as having intentions and creating a narrative (Scholl & Tremoulet, 2000). Participants can for instance interpret that the geometrical figures have feelings and are interacting with each other. This interpretation is only based on how the figures are moving. Both perceptual causality and animacy show how much interpretation and high-level cognition can occur based on little stimuli.

When the moving object is more complex than a geometrical figure, the same tendencies of animacy can be observed. As already mentioned, Schulz et al. (2018) researched the implementation of robotic movement inspired by film animation. According to them, this can lead to animacy and cause the robots to be interpreted as more 'alive'. Following Thomas & Johnston's (1995) principles of animation can affect the experience of the robot and thus the interaction. For example, the animated nature could lead to the robot being perceived as more intelligent (Bartneck et al., 2007). Schulz et al. (2018) also argue that movement inspired by animation can lead to the interpretation that the robot has a personality, due to a more distinctive movement style.

These examples illustrate how the brain is almost hardwired to process movements from its surroundings. They also illustrate how the brain can give meaning to sensory input, and perhaps 'see things that are not there' by giving meaning and context beyond what is observed. This automatic perception can affect how we interpret robots and especially moving robots.

2.2.2 THINKING FAST AND SLOW - SYSTEMS 1 AND 2

In addition to automatic perception, human thought processes can be more controlled. In the field of psychology, the thought process can be divided into two separate systems which Kahneman (2012) elaborates in his book "Thinking fast and slow". He uses the labels System 1 and System 2, as first suggested by Keith Stanovich and Richard West (referred to in Kahneman, 2012), to distinguish between these two processes. System 1 is more intuitive and fast, while System 2 is slower and the thought process is more well-considered (Kahneman, 2012). For example, turning towards the source of a sudden noise is an automatic activity that System 1 consists of. Trying to identify the same surprising sound would be an example of an activity that belongs to System 2. Both systems influence each other mutually and can affect the choices and assessments we humans make.

Złotowski et al. (2018) suggest that when interacting with a robot a fast and autonomous Type 1 process may lead to an interpretation of the robot as having attributes similar to a living entity. A slower and more controlled Type 2 system, on the other hand, may affect how people explicitly declare what they perceive. According to Złotowski et al. (2018), it is possible to view robots as not having human-like attributes, while behaving socially towards it at the same time. They speculate whether the effect of a dual-processing system, similar to what Kahneman writes about, could be the reason. Again, it is not clear how the two systems work together, but they may affect how the overall experience of robots is experienced and later talked about. It could potentially lead to conflicting attitudes towards being with a robot.

2.2.3 ANTHROPOMORPHISM AND ZOOMORPHISM

Multiple studies have found that robots can be perceived as animate (Darling, 2017; Darling et al., 2015; Levillain & Zibetti, 2017; Rosenthal-von der Pütten et al., 2013; Sirkin et al., 2015; Turkle et al., 2006). The effect of anthropomorphism and zoomorphism is when an artefact is perceived as having human- or animal-like features. Anthropomorphism has been defined by Epley et al., (2007, p. 864) as "(...) the tendency to imbue the real or imagined behaviour of nonhuman agents with humanlike characteristics, motivations, intentions, or emotions". Thus, humans interpret objects as having capabilities they may not have. The effect can lead humans to treat artefacts as if they were alive, even with the knowledge that they are not Duffy & Zawieska, (2012).

For instance, in a CNN article, Parke (2015) asked whether it is cruel to kick a robot dog. The article was written after a video illustrating Big dog's balance by kicking it, went viral. Some of the reactions would suggest that some people felt empathy for the robot and were not just concerned about damaging valuable technology. Further, Rosenthal-von der Pütten et al. (2013) found that humans felt emotionally distressed watching the robot Pleo being 'tortured' – by being choked, hit against a table, punched – even though the participants were aware that it was only a robot.

Furthermore, anthropomorphism can be viewed as either implicit or explicit (Złotowski et al., 2018). Explicit anthropomorphism is the perception of human- (or animal-) like attributions that can be expressed verbally. Implicit anthropomorphism is when these attributes are understood through a person's behaviour, and the perception is done less deliberately or consciously (Cappuccio et al., 2021). As already mentioned Złotowski et al. (2018) argue that what is expressed explicitly about a robot may not be congruent with how one behaves when being with it. This suggests that the underlying mechanisms for anthropomorphism could be a combination of various cognitive processes, with different results.

The effect of anthropomorphism can be used when designing. Social robots can be designed to enhance anthropo- and zoomorphism and explicitly promote social engagement. Humans can attribute human-like qualities to robots to create a logical explanation for the action of the robot (Duffy, 2003). The rationalisation makes it easier to understand the action according to their own experiences. This is something designers can facilitate and aim for in their design (Duffy, 2003; Fong et al. 2003).

A non-social robot, however, is not designed to have social capabilities or to promote meaningful social interaction. Darling (2017) suggests that these robots still can be perceived as social actors. According to Darling (TED, 2018), humans only need movement to perceive the moving thing as autonomous to start anthropomorphising or zoomorphising because it is hardwired into us. Removing all traits associated with humans or animals, all that remains is a moving shape. This can be enough for humans to create a persona for it, give it names and have empathy towards it. This is consistent with what Sirkin et al. (2015) found in their study about a mechanical ottoman. The mechanical ottoman – a robotic footstool – was perceived as both something almost alive and as a functional object. Some of the participants did not want to lay their feet on the ottoman because they perceived it almost like a pet. The mechanical ottoman is not visually designed to promote anthropomorphism, but its movements led to a perception of it as something more than just a moving footstool.

2.3 BEING WITH ROBOTS

2.3.1 SIMULATION OF HUMAN ACTIONS

How humans talk about being around robots can be misleading and perhaps in turn affect how robots are designed and influence how humans experience them. (Seibt, 2018) argues that robots and humans cannot *work together* because both parties need to be aware of the action of working. According to her, robots cannot experience the act of working. Hence, humans and robots do not share the experience and cannot work together. However, humans can experience the relationship '*as if*' working together. (Seibt, 2018) describes two different ways to view the notion of 'as if' 1) make-believe and fiction and 2) a way to characterise a robot's movement after human behaviour.

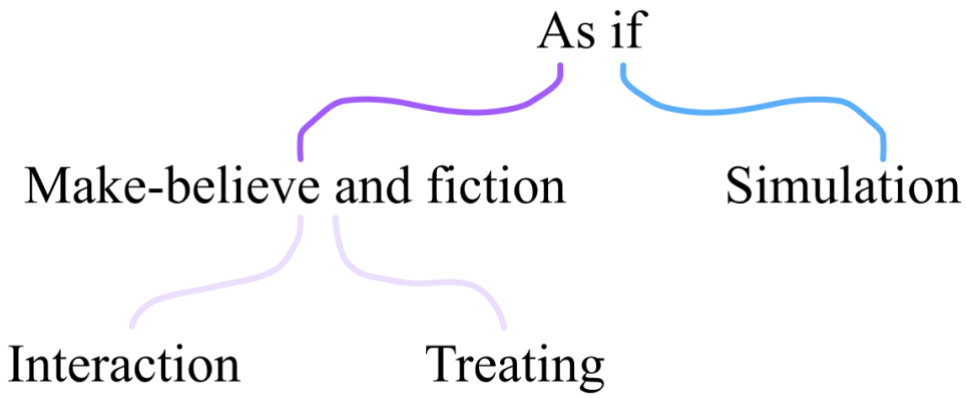

FIGURE 1: OUR INTERPRETATION OF HOW SEIBT (2018) DESCRIBES THE NOTION OF 'AS IF'.

When 'as if' has the meaning of make-believe and fiction, humans describe interaction with robots as make-believe scenarios where the robot (objects) are treated as something different or as if it were something else (Seibt, 2017). Further, she distinguishes between *treating* an object as if it was something else and *interacting* with an object as if it was something else. When treating an object 'as if', the interaction is one-sided; the human interacts with the object without the object showing any behaviour in return. When interacting 'as if', the behaviour of the object reminds the human of actions and reactions that would typically occur during an interaction. For example, a car could be treated lovingly as if it was a friend by looking after and taking care of it. The car would not show any affection in return. A robot like Paro, on the other hand, could be interacted with as if it was a friend. Not much is

required before humans start treating objects as if they were humans or a companion when the form of the robot is based on similarities and analogies (Seibt, 2017).

According to Seibt, there is a need to be a clear distinction between the 'as if' related to make-believe and fiction, and the 'as if' used to characterise a robot's actions. The latter is the 'as if of simulation'(Seibt, 2018). She states that humans produce simulations to better understand the original process and uses the work of the police to exemplify this: Police recreates – or simulates – a crime to understand the significance of already found evidence. She argues that the best way to describe simulations is to view them as relationships between processes (Seibt, 2018). There are five relationships for processes that deviate from the 'baseline'. The baseline is called *realisation* and involves no degree of simulation. *Realisation* is followed by *functional replication* with a strong degree of simulation. The next relationships are *imitation, mimicking* and *displaying*. Lastly, there is *approximating,* the least degree of simulation (Seibt, 2017, 2018). Seibt underlines that with the current state of technology, there are no robots who simulate on a level higher than displaying (Seibt, 2017).

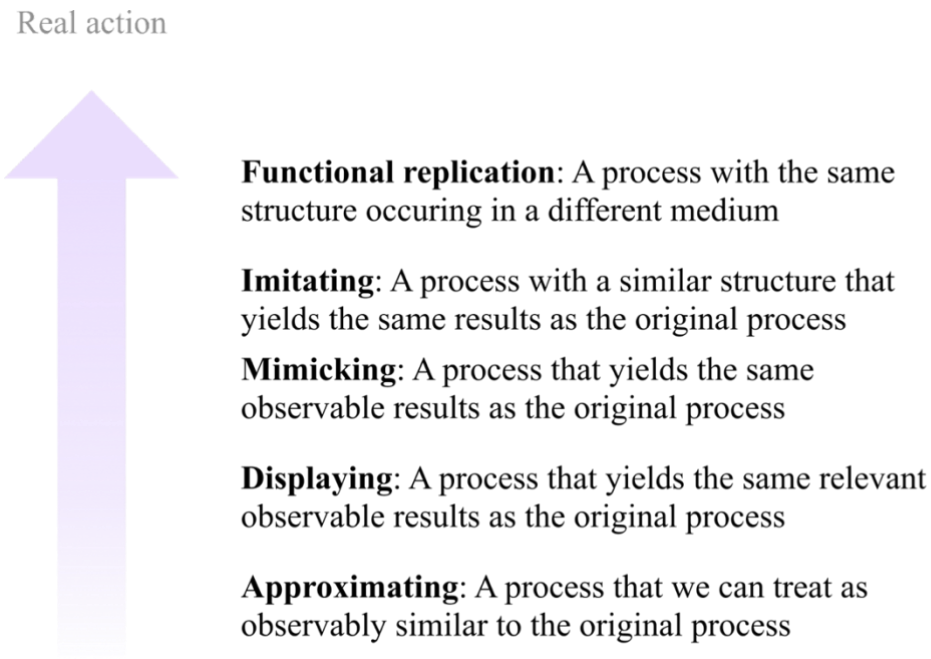

FIGURE 2: OUR INTERPRETATION OF LAYERS OF SIMULATIONS, AS DESCRIBED BY SEIBT (2018)

2.3.2 HUMAN-ROBOT TEAMS

Robots can be designed to work autonomously without human interference, and in teams. Hybrid military teams, consisting of soldiers and autonomous artificial agents, could be the future of the military (Cappuccio et al., 2021; Phillips et al., 2012). Both Cappuccio et al. (2021) and Phillips et al. (2012) state that the hybrid military teams would benefit from the transition where military robots are viewed as a teammate rather than a tool. A successful teammate would often need to master informal communication, such as gaze, gesture, posture, and body language, in order to have smooth and well-coordinated communication in the team. Further, for a robotic team member, it can be necessary to be able to produce and respond to commands that are not necessarily explicit (Cappuccio et al., 2021). According to Cappuccio et al. (2021), anthropomorphism could contribute to this in that the robot can be interpreted as something recognisable that the soldiers would be familiar interacting with.

Human-animal teams can be used as an inspiration for how human-robot teams could work and could help humans to understand the limits and possibilities of a robotic teammate (Phillips et al., 2012). For instance, a robot resembling a horse could facilitate the same interaction someone would have with a horse. Such design can also facilitate building (alterity) relations with robots (Coeckelbergh, 2011b). How a robot appears and whether a relation is built can be analogous to human-animal teams.

Using animal analogies can be beneficial in for instance a military context when robots should be viewed as a teammate rather than a tool. Phillips et al. (2012) argue that there is not a clear distinction between tool and teammate, but that it is a continuum. They illustrate this in their tool-teammate continuum, where the amount of task interdependence and communication goes from low to high on separate axes.

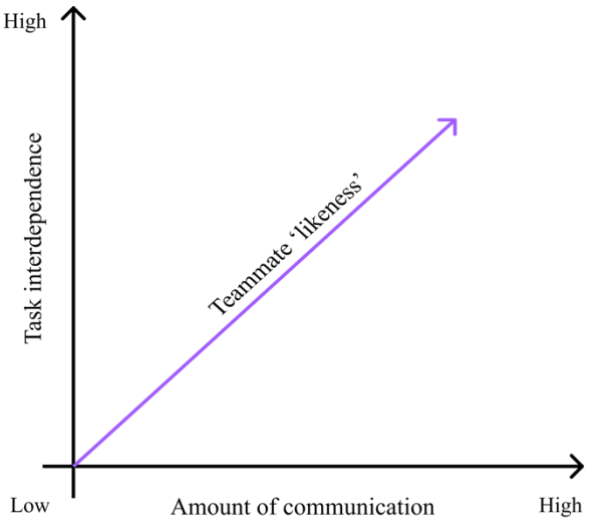

FIGURE 3: TOOL TO TEAMMATE CONTINUUM, FROM PHILLIPS ET AL. (2012).

Task interdependence can be understood as the degree of reliance there is between team members to effectively complete a task (Phillips et al., 2012). For example, a human-canine narcotics search team would require a high degree of interdependence because each member in this team relies on each other to find narcotics. The dogs and humans are working as independent partners within this team. A human-canary team on the other hand would be a low interdependence team as the canary is used as an extension of a human's instinctual abilities and does not depend on the human partner. When defining team communication, (Phillips et al., 2012, p. 1555) refer to Kraiger & Wentzel: “Team communication is about interaction and coordination that can lead to shared mental models”. Following this definition, dog obedience trials would involve a high degree of team communication as it results in a greater understanding of the team members' needs and intentions. Oxen plowing fields would require a low amount of communication.

A team that is low in both task interdependence and amount of communication would perhaps consist of an animal, or perhaps a robot, that is more similar to a tool. In contrast, a team with an animal or robot that is considered more teammate-like would be a team that is higher in both task interdependence and amount of communication. Drawing inspiration from animals can help create a robot teammate by looking at the role and functionality the robot should have. This can further be helpful when designing human-robot teams.

2.4 ETHICAL CONCERNS WITH ROBOT TECHNOLOGY

There is a lot to address regarding ethical concerns with robot technology. For instance, there is some research regarding privacy and surveillance (Almeida et al., 2021; A. Sharkey & Sharkey, 2012), objectification (Vallor, 2011), robotic rights (Darling, 2016; Gunkel, 2018) and autonomy (Brooks, 2017; Shneiderman, 2020). When it comes to a military context and the use of robots, the usage of drones (Carlsson et al., 2015) and other autonomous technology open up for other ethical concerns like whether or not – and to what degree – a human should be involved (Sharkey, 2014). However, we will not address it all in this chapter. Rather, we want to briefly explain two topics we mean are important to have in mind regarding the notion of 'being with' a robot. These two topics are society and technology, and deceit.

2.4.1 SOCIETY AND TECHNOLOGY

We believe it is important to look at robot technology from a societal perspective. Feng & Feenberg (2008) talk about how technology and society can affect each other in three different ways. One way is that technology and society can affect each other interchangeably. In the case of robot technology, society can affect how we develop and use the technology because we have different needs and have become aware of its possibilities. At the same time, the same technology can influence our work environment and how we work.

For example, there is a current need for better healthcare and technology can help to achieve this. Such technology could be the robot Perl, described by Pollack et al. (2002). With the implementation of healthcare robots such as Perl, the work assignment to people working in healthcare would perhaps change, as some of the robot's work tasks involve reminding, informing, and assisting elderly people. Previously, an elderly would need help from a healthcare worker to be reminded of an appointment for physiotherapy. At the same time, the use of technology can influence what healthcare workers need to do in their work.

With more robot technology entering society, Darling (2016) emphasises the importance of determining what the robot's role is and what it should do. Depending on what role the robot has, different issues can arise. If the robot is to replace human workers there is a need to

consider topics like the quality of work as well as efficiency and effectiveness. If the robot is to 'only' assist, the need to consider how the introduction can potentially change and affect work practices and to what extent the human should be in control. Darling calls for careful consideration when introducing robots into society and workplaces.

Seibt (2016) even suggests that designing robots is almost the same as designing culture. Because of the uncertainty regarding how new technology can affect society long-term, it can be challenging to predict how the balance between technology and society will evolve. We agree and believe it can be demanding to predict how the experience of being with a robot will be. Especially since the experience can be affected by the evolving society and technology. Even though it can be demanding it is important to research aspects related to designing robots.

2.4.2 DECEIT

With more complex technology and robots that almost seem alive, it can be challenging for humans to understand exactly what they interact with. This is something Kristen Nygaard questioned already in the 1980s. Svein Anton Hovde (personal communication, 6th December 2021) refers to Kristen Nygaard in an unpublished manuscript. The manuscript refers to a lecture given by Nygaard where he proposed an 11th commandment emphasising the importance that users always should know if and when they are communicating with a machine or human. 40 years later this is still relevant.

Further, Darling (2016) states that people give robots intent, feelings, and states of mind. She argues that some robots are designed for autonomous behaviour, which makes humans see feelings that the robot does not have. This can be especially challenging for vulnerable users such as the elderly and children. There should be a focus on whether it is ethical to design and develop technology that may be interpreted as deceiving.

2.5 SUMMARY OF THE BACKGROUND

Here we have made a theoretical foundation of what we find relevant in the literature for this project. We started by defining the form viewed from an HRI-perspective and why it can be important to focus on when designing. This will be important for the discussion in chapter 7. Different theories on psychological mechanisms from the field of psychology were then presented, as we believe this can be helpful to discuss our findings on how complex the experience of robots can be. We have also presented perspectives on how human-robot-interaction and -cooperation can be viewed. Finally, we presented a broader view of the ethical issues of using robot technology.

CHAPTER 3: THEORETICAL FRAMEWORK

For our theoretical framework, we have been guided by existing theories and concepts on how people experience robots and how experiences are talked about. Based on the existing literature we have chosen to divide our theoretical framework into three main parts: *3.1 Ways to explain experience*, *3.2 Objects as tools,* and *3.3 The experience and use of robots*

In chapter 3.1 we first demonstrate how language and experience can be connected and describe how humans can talk to and about robots. This is followed by a brief introduction of what technical language is and how humans can use it to describe phenomena. Lastly, we present a theory about metaphors, which shows how humans talk using familiar activities and personification to convey something. In chapter 3.2, we introduce Heidegger's perspective on what equipment and tools are. Chapter 3.3 introduces different theories regarding how robots can be experienced. We present theories about how robots can be perceived as a tool, a companion, or something in between. Following this, we introduce the concepts *quasi-other* and *quasi-otherness* to further understand what that sense of 'something in between' can imply.

3.1 WAYS TO EXPLAIN EXPERIENCE

3.1.1 INHERENT INTERTWINEDNESS BETWEEN LANGUAGE AND EXPERIENCE

Robots can be viewed as something technical or something similar to a living entity (Coeckelbergh, 2011a; Darling, 2016; Turkle et al., 2006). Thus, it can be explained and understood very differently depending on the experience. According to Coeckelbergh (2011a), the usage of personal or impersonal third-person perspective might indicate how a user views the robot. The personal perspective, the usage of *he* or *she* when referring to the robot, could indicate that the user considers the robot as something more than a machine. While the impersonal perspective, the usage of *it* when referring to the robot, could indicate the view of the robot as a machine. Coeckelbergh also states that a shift from impersonal to personal might happen when the robot no longer is considered a machine: *it* becomes *he* or

she. The same shift could occur when humans interact with intelligent animals (Coeckelbergh, 2011a). Some also experience the shift when talking about common objects such as cars and other things.

Furthermore, Coeckelbergh (2011a) sees a change in how humans talk *about* robots and talking *to* robots. When talking *to* robots, humans use second-person perspective; Speech is directed towards and to the robot using *you.* This is done in a way that the robot, and the relation between the human and the robot, is constructed as companions or as a partner. Coeckelbergh suggests that if the robot talks back, a dialogue is created, and the human can talk *with* the robot. The dialogue could establish the 'need' for the human to refer to themselves and the robot in the first-person plural – *we* –when talking to another human or artificial other.

From this, it may be easier to eventually think of the robot almost like a subject, with a consciousness. Coeckelbergh (2011a) writes that this may lead to an experience of intersubjectivity with the robot and create a social reality. This illustrates how language and experience can be connected and influence each other.

3.1.2 THE USAGE OF TECHNICAL LANGUAGE

Coeckelbergh (2011a) argues that our limited experience with robots, the western outlook and language make a strict distinction between subject and object. This can prevent us from viewing robots as something in between. We believe the limited experience might lead to less precise descriptions of the experience. With more experience, humans can talk about robots and the experience using technical language, which often are more precise descriptions of phenomena (Winter, 2019). A technical language can also be abstract but differs from other abstract descriptions as it identifies elements within a larger scientific system (Winter, 2019). For instance, is 'hertz' used to describe a sound and the wavelength or a hexadecimal code used to describe a colour. According to Winter (2019), a technical language relies on the evolvement of society as it uses the knowledge humans have established about the physical characteristics of perception.

However, even though such descriptions require expert knowledge, some technical vocabulary has become a part of everyday language in the general population. Winter (2019) exemplifies this with units for time and distance: time can be measured using temporal measurement units such as minutes or days, while distance can be measured using spatial measurement units such as metres and kilometres.

Winter (2019) further states that technical descriptions are always relative to a whole system. This means that the user of a spatial measurement unit, such as 'meter', needs to know the underlying scale of how distance is counted in metres and kilometres. Even though technical descriptions can be more precise, it is not always the easiest to relate to as it requires a shared understanding and expertise regarding the phenomenon.

3.1.3 THE USAGE OF METAPHORS

Coeckelbergh (2011a) questions if humans do not have the language for how robots are experienced. Thus, it can be challenging to use precise language such as a technical one. Extending on Coeckelbergh's question, we wonder if humans use a language with for instance metaphors as an alternative to convey their mixed experience and when a technical language is not available. The usage of metaphors can be described as "(...) understanding and experiencing one kind of thing in terms of another*"*(Larkoff & Johnson, 1980, p. 5). According to Larkoff & Johnson (1980), the way humans think, and act is fundamentally metaphorical and governs our functions down to the most mundane details; The way we think, what we experience and what we do is a matter of metaphors.

Humans use *metaphorical concepts* to structure what they do and how they understand what they are doing (Larkoff & Johnson, 1980). The authors distinguish between different types of metaphorical concepts based on *how* humans talk and experience a concept: Structural metaphors, Orientational metaphors and Ontological metaphors.

Structural metaphors refer to the structure behind the words humans use and the understanding behind them. This structure in language comes from the structure within the metaphorical concept; the vocabulary related to a concept, e.g., an argument creates a systematic way of talking about the battling aspects that occur during arguing. The authors argue that the activity *argument* is partially structured, understood, performed and talked about using terms of war and refers to ordinary sentences such as "Your claims are *indefensible*" and "If you use that *strategy*, he'll *wipe you out*". When humans talk about an argument, war becomes a metaphorical concept because the words used are similar, or the same, like the ones used when talking about war.

In orientational metaphors, whole systems of concepts are organised in relation to each other. This is mostly done using spatial orientation such as up-down, front-back and central-peripheral. Such metaphors give concepts a spatial orientation where for instance happy, conscious and health are 'up', and sad, unconsciousness and sickness is 'down'. For example, if you are ecstatic, you could say that you are *on cloud nine*. On the other hand, if you had a really bad day you could say that you have *been through hell*. The usage of such metaphorical orientation is not random and has a basis in physical and cultural experiences. A happy person often gets physically taller and has a different posture, compared to a sad person who typically would adopt a more drooping posture.

The human experience with physical objects provides the basis for ontological metaphors (Larkoff & Johnson, 1980). Ontological metaphors allow humans to view experiences such as events, activities, emotions and ideas as entities and substances. When the experience is treated as an entity or substance of a uniform kind it can be referred to, categorised, grouped and quantified. It is also possible to reason with it (Larkoff & Johnson, 1980). Furthermore, the usage of ontological metaphors allows humans to talk about abstract phenomena with tangible characteristics: A person's ego could be seen and talked about as *fragile*.

According to Larkoff and Johnson (1980), the most obvious ontological metaphors are perhaps where the physical object is further specified as being a person. This type of ontological metaphors are referred to as *personification* and are a general category that covers a wide range of metaphors. Using personification, humans can understand experiences with non-human objects with the use of human motivations, characteristics and activities. Personification is possible to understand based on own motivations, goals, actions and characteristics. However, as personification is a general category, it allows humans to be specific in the metaphor. For example, inflation could be seen as the 'enemy'. This allows for not only a specific way of thinking but also a way to act towards it.

3.2 OBJECTS AS TOOLS

3.2.1 EQUIPMENT

According to Heidegger (as cited in Dourish, 2004), objects that are used by humans as '*something-in-order-to*' are equipment in some way. Heidegger's equipment refers to a usage where the object, or entity, is used to accomplish something and to encounter the world. Equipment could be understood as a collective noun where equipmental entities such as tools, machines, and instruments belong, as they all are 'something-in-order-to'. According to Heidegger (as mentioned in Gunkel, 2018), technology is just a means for humans to reach a goal, making technology 'something-in-order-to'. This understanding includes all technology, from handheld tools to robots (Heidegger, 1997, in Gunkel, 2018).

What determines whether an object is perceived as an equipmental entity is the user's intention. The intention directs the usage of the entity, making it something-in-order-to reach the goal. For instance, a hammer could be used with the intent of hammering a nail into a wall. The hammer is not a tool in itself but becomes a tool when it is 'something-in-order-to' hammer a nail into a wall. As we understand this, it does not necessarily matter what entity is used as a tool and whether it is designed to be used in a specific context. For instance, if a human wants to hammer a nail into a wall, any object that can be used to push the nail into the wood can be used as a tool for said activity. It does not matter if the entity is a rock, a shovel, or a banana, as long as it gets the job done. Furthermore, an entity can also become

different tools depending on the user's intention. The user's intention and context decide what type of equipment the entity is; a kitchen knife could be used to cut vegetables, but also to murder someone (Harman, 2010).

3.2.2 WAYS TO USE TOOLS

Heidegger introduces two different ways of engaging in the usage of tools; '*ready-to-hand'* and '*present-at-hand'*. 'Ready-to-hand' is when a tool is so integrated in the use activity that the user stops paying attention to it, and it almost becomes an extension of that user's own body. The tool – or equipmental entity – stops being perceived as an independent object as the mental focus shifts from giving attention to the object to treating it as an extension of the body or activity (Dourish, 2004). For instance, the act of writing on a computer could be interpreted as 'ready-to-hand' if the user is familiar with the layout and size of the keyboard. When the user is familiar, the user does not need to pay attention to the keys. The writing is just happening and the keyboard could almost be experienced as a part of oneself.

However, if one keys one the keyboard is slow or stuck, the flow of the writing would be interrupted and the user's attention would become more focused on the keyboard and specific key. The usage of the keyboard would become 'present-at-hand'. 'Present-at-hand' is when a tool is not 'concealed from view', but focused on. This can happen at least in three different ways according to Harman (2010). We understand these ways as an examination of entities and using entities that are broken or unfamiliar. For instance, when one first starts to use an unfamiliar tool it requires more focus for it to be used for the activity it is intended to. An example of this would be if someone who is used to computers suddenly was asked to write on a typewriter instead.

3.3 THE EXPERIENCE AND USE OF ROBOTS

3.3.1 TOOL, COMPANION, OR SOMETHING IN BETWEEN?

According to Reeves and Nass (see Gunkel (2018)), humans often show a tendency to treat socially interactive technology as other people. Even when technologies such as robots are intended to be perceived as tools. This may not always be the case and is illustrated in a previously mentioned example with the colonel and the demining robot. Humans can experience that they have a 'social' relationship with a robot, or perceive the robot as 'social' (Coeckelbergh, 2011a). It has been suggested that all it takes for humans to treat technology such as robots as social actors is behaviour that suggests social presence (Gunkel, 2018), movement (Darling, 2016), or similarities and analogies (Seibt, 2017).

Similar to Coeckelbergh (2011a), Darling (2016) states that there is a difference in how we perceive robots and other objects. For instance, she explains the difference between a social robot, like a Pleo dinosaur toy, and a household appliance, like a toaster; Even though both technologies are made by humans and can easily be bought by consumers, she argues that they are perceived differently. According to Darling (2016), people tend to perceive e.g. states of mind in robotic objects. As Pleo is a social robot it might be intended to be perceived more like a social actor compared to a toaster.

There are two different perspectives – or 'glasses' – to understand how humans view robots or other objects (Coeckelbergh, 2011a). The first perspective views robots as either mere objects/machines or subjects. The second perspective is a hybrid and not as strict as the first view. In this perspective, perception is more of a transition from object towards subject. In this thesis, we agree with the second perspective. He further argues that the usage of language and social relations can push the way humans perceive robots in different directions. The view on robots would be created by, and become visible in, the language that is used.

3.3.2 FORMS OF OTHERNESS

When objects such as robots are experienced as something more than a tool, the experience could be described as *technological otherness,* or *'quasi-otherness'* (Ihde, 1990). Quasi-otherness is different from the otherness one might experience towards a tool, as this is mere objectness. Quasi-otherness is experienced stronger than objectness, but weaker than the otherness experienced with a dog. For instance, you could have a social relationship with a dog, and the dog would, according to Ihde, then be perceived as an *animal otherness*. A relationship with a robot would be similar, but not the same. The robot would be perceived as a *quasi-other*.

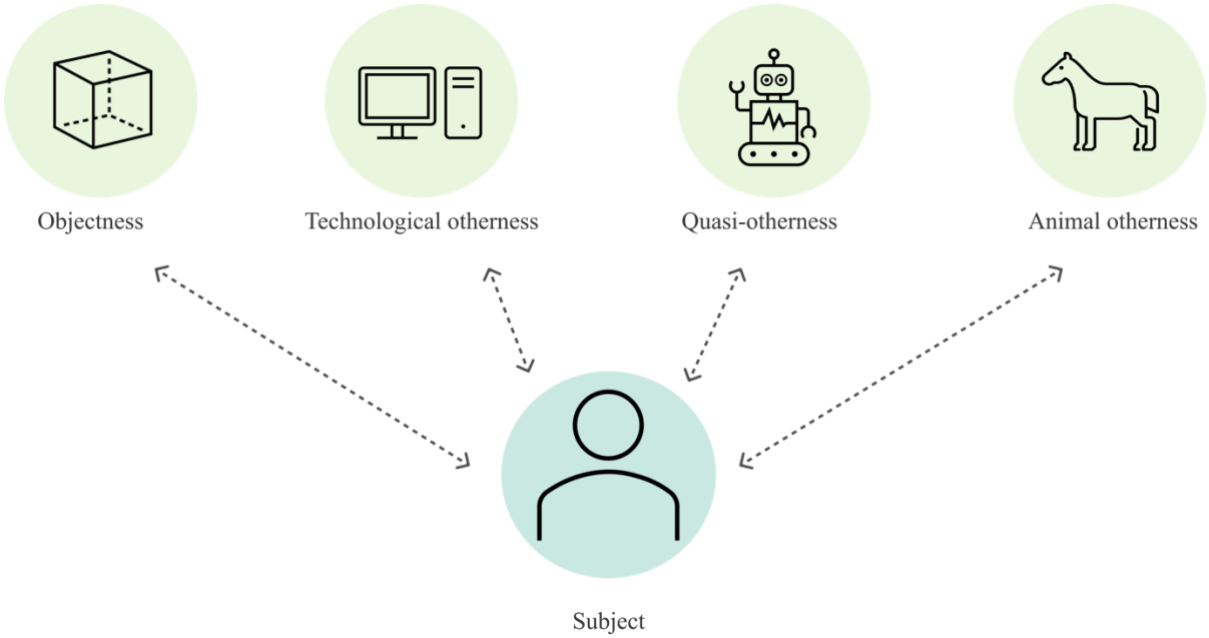

FIGURE 4: OUR ILLUSTRATION OF HOW A SUBJECT IS RELATED TO OTHERNESSES. THE ILLUSTRATION IS BASED ON IHDE'S (1990) DEFINITION OF OTHERNESS.

When investigating how humans experience robots, we consider ‘otherness’ to encompass more than quasi-other. It is our understanding that Ihde’s use of quasi-other in regard to how a robot is perceived is somewhat different from ours. Ihde (1990) argues that all robots will be perceived as a quasi-other. We, on the other hand, believe the perception of a robot as a quasi-other would depend on the robot's similarities to a subject. We believe the perception of the robot would be an otherness, but not necessarily as a quasi-other. We understand otherness as a gradual shift from tool, while quasi-other is further towards the perception of a subject.

We interpret the experience of a quasi-other as a ‘type of experienced sociality’ (TES). According to Seibt et al. (2021), humans can experience different types of sociality and question whether it is the same experienced sociality when someone is ‘being with a robot’ and ‘being with a cat’. The different types of experienced sociality (TES) are about the feeling of a co-presence or ‘being with’ something or someone. This concept makes it possible to distinguish and identify nuances in experiences of ‘being with’.

The concept of TES is an extension of *sociomorphism*, a concept also introduced by Seibt et al. (2021). They want to challenge the assumption that social interaction with robots is due to anthropomorphism – that humans perceive human capabilities in robots. The authors argue that it is not anthropomorphism that happens but rather the perception of non-human social capacities – sociomorphism. We interpret that quasi-otherness is a result of sociomorphism.

3.4 SUMMATION OF OUR THEORETICAL FRAMEWORK

This chapter has been about different concepts and theories that have guided our research process. In part 3.1 we have shown how it gets complicated when language and experience can influence each other. We have also illustrated how our language can vary and that we often have to interpret what is said explicitly to understand the meaning. Language and communication can include both metaphors and be very precise descriptions that resemble or are technical language. In part 3.2 we have looked at how Heidegger defines tools and how technology such as robots fits into the category of equipment. The understanding of engagement in usage – 'ready-to-hand' and 'present-at-hand' – shows us how we relate to tools and other types of equipment. In the final part, 3.3 we have brought up concepts that illustrate how complex the perception of robots can be. From our point of view, the perception and experience of robots are not as straightforward as tools or something more. Our theoretical framework creates the lens for our research and is the foundation for our *analytical framework*, which we will come back to in chapter 6.

CHAPTER 4: APPROACH AND METHODS

This chapter elaborates on the theoretical and empirical background of this project. We have performed a qualitative multiple case study, using various methods to gather data. We will begin by explaining our paradigm and the chosen methodology. Afterward, our two cases will be presented and briefly compared. Finally, we will explain the various methods we have used for both data collection and analysis. The execution of the project will be explained in chapter 5.

4.1 PARADIGM

In this study, we follow an interpretive paradigm. We believe the reality of experiencing *something* is influenced and shaped by earlier experience. As mentioned, we have defined experience as "the content of a person's subjective knowledge and history, of external sensory influence (perception), emotional state (feelings), thought processes, motivation and more" ('opplevelse', 2020, translated from Norwegian by Tora and Runa). Hence, we believe experience is a subjective truth and perhaps also influenced by the social context. We see reality as a social construct, making our paradigm interpretive. This social construction can be made available through language, consciousness, and shared meaning (Myers, living version), hence we have chosen to follow a methodology and methods that facilitate the gathering of such data.

An important aspect of our research has been to work towards intersubjectivity, rather than seeking an objective truth. This is an important aspect of the interpretive paradigm, to better understand the informant's subjective reality (Walsham, 2006). We have aimed to understand how some informants describe their experience, rather than trying to describe an objective experience that many people share.

4.2 METHODOLOGY

We have conducted a *case study*. Because of our research questions, a methodology that facilitated investigation in a natural context was chosen. This could help our informants to talk about the experience and perhaps stimulate memory. A natural context creates the opportunity to gain unique perspectives that could help understand the informants' experiences (Blomberg, 1993). Furthermore, we wanted to gain rich descriptions, something an in-depth study could help us with. Both ethnography and case study could make this possible. But as our research question is not about robots in a specific context, we also needed a methodology that could provide a broad understanding of this phenomenon, as well as depth.

We chose to do a multiple case study where we investigated the experience of being with a robot in two cases. This has been in order to find out how experience can be described, and therefore it was necessary to compare what the experience could be. Our interest has never been to investigate why people want to have e.g., a robotic vacuum cleaner, rather it has been to investigate similarities and differences regarding how being with the robot is experienced. The robots in themselves were not the main focus. The cases were a great starting point to investigate how people can experience being with a robot so that we later can systematise and describe the experience. This makes the case study instrumental, where the cases are used to understand something more than the cases themselves (Stake, 2005).

We wanted to do a theoretical replication where two different cases were compared to try to explain potential differences in the data generated. A theoretical replication is therefore suitable, in contrast to a literal replication where two similar cases are compared (Baxter & Jack, 2008). We want to describe and explore how people experience different robots in different contexts and give the reader an example of how this experience might be in various conditions. The difference in experience could be seen as comparative descriptions (Stake, 2005). We argue that the chosen cases are comparable even though they are different, as they both involve non-social robots that are used as tools. Therefore, it is interesting to explore and compare the experiences in these cases.

We have been inspired by phenomenology and autoethnography. Phenomenology studies conscious experience from the subjective point of view through e.g., perception, thought and memory (Smith, 2018). This agrees with our understanding of how we could investigate the experience of being with a robot. Because experience with robots is a phenomenon that can be difficult to gain access to with traditional methods such as interviews and diaries, we wanted to explore different approaches. Therefore, we believed a phenomenological aligned approach could help us to explore experiences. It can be challenging to ask directly how people experience something as it can be difficult to know how to answer. Instead, we have asked more indirectly about aspects that might help to explain those experiences.

Furthermore, autoethnography has been a significant inspiration. How one experiences robots is subjective, and we believe that our own subjective experience may be just as relevant. Autoethnography is a great method to gain insider knowledge and complement existing research with new perspectives (Adams et al., 2017). We were inspired by Verne's (2020) autoethnography approach with her lawnmower. Because of this, we have chosen to include our thoughts, reflections, and experiences throughout our research. Experience, like tacit knowledge, can be difficult to capture through more traditional research methods. Adams et al. (2017) argue that how we see, hear, think, and feel become part of the 'field', which can be useful when we want to understand the experience. This may be important to gain intersubjectivity with our participants.

In addition, our process has been influenced by our background and education as interaction designers. Especially our analysis, our iterative approach, and the design-oriented result. It could be argued that we could have been inspired by Design research. However, this was not the intention, rather we have used many of the same methods, tools, and techniques used in Design research as they facilitate expression of e.g. usage and use context (G. Verne & Bratteteig, 2018).

4.3 CASE DESCRIPTION

To gain information that could give us insight into our research questions, we conducted a multiple case study. We argue that the robots in our cases are non-social robots, as they are not designed to facilitate meaningful social interaction. Our first case looks into a more domestic context, where the robot has become normal to have in a household. Our second case was chosen to provide insights into how a fairly new and unfamiliar robot was experienced. By contrasting the cases we can use them as different points of reference, and thus perhaps find new aspects of experiencing being with a robot.

4.3.1 CASE 1 – DOMESTIC ROBOTS

The robots and their role

Our first case deals with two different types of robots: robotic lawnmowers and robotic vacuum cleaners. They are both designed to assist the user, whether it is lawn mowing or vacuuming. Therefore, we argue that the robots have a similar role and we want to look at them as one case even though they have some differences. The robots within this case will be referred to as ‘domestic robots’.

Furthermore, these robots are somewhat integrated into society and have become a more normal artefact in a household. They could be seen as luxury or welfare technology, depending on the user. For a user who does not have a disability or is elderly, a robotic vacuum cleaner or lawnmower is not a necessity. We would argue that the robot could be viewed as luxury. The robot could however be viewed as welfare technology for a user who, for some reason, can not manage to cut the grass or clean the floor. This case does not look into the reason why the user got their robot, but rather how the robot is experienced.

Shape and form

Every robot studied in this case has a geometrical shape with rounded edges and wheels. The robots vary slightly in size, but none are bigger than 50 cm or less than 30 cm in length. The biggest difference in form is that the vacuum cleaner is smaller in both width and length and

has a more circular shape. The lawnmower is more rectangular. Both robots are small when it comes to height.

The movement is global and could be described as linear. The direction of the robot changes when an obstacle is encountered. An obstacle could be an object, a wall, or the edge of its working area. The direction could also change if the user gives the command ‘go to docking’. When encountering something unexpected both robots could either try to overcome it, move around it or change direction. The domestic robots can both move in predetermined patterns and be controlled through an app. Some generate a map of the working area and its obstacles.

IMAGE 1: ILLUSTRATION OF TYPICAL ROBOT LAWNMOWER AND VACUUM CLEANER. PHOTOS FROM PIXABAY.

Use and use context

The different types of robots and their tasks also present different types of use contexts, namely indoor and outdoor contexts. Despite the differences in use context, we argue that the usage itself is relatively similar. This, together with the robots' role, strengthens our view of these two robots as one case.

The user doesn't need to be in the same area or context as the robot to get the chores done. Most of the robots can be controlled with an app. The work can be supervised using the app's map over the robot's working area. Such functionality makes it possible for the user to always

have a newly mowed lawn at the cabin or to have the living room vacuumed before getting home from work. There is also the possibility to work alongside the robot, as some of our informants do. Users with robotic vacuum cleaners, for instance, create distinct working areas for the robot and clean the areas not included themselves. This seems to be because of the limitations of the robot, such as being unable to cross thresholds with a certain height.

The owners of robotic lawnmowers can also create distinct working areas for their robot using either a map, guiding cords, or both. By creating working areas users can limit the number of times the robot gets stuck in e.g. bushes, roots, or deep slopes. The work areas can change and be rearranged as users get more familiar with the limitations of their robot, which can be challenging to predict.

In a contrast to the vacuum owners, the lawnmower owners seem to prefer not to work alongside their robot. It would get in the way of their gardening or run over gardening tools. When the user wants to relax in the garden or do some gardening, all the user has to do is guide the robot to its docking station using either the app or pressing the ‘home’ button on the robot.

Even though the robots are controlled and supervised by the users, they are to some degree autonomous. Both robots could ‘find their way home’ if told so by the user. It could also do so if it is low on power. Then it has to get to its docking station before it runs out of power. Oftentimes choosing the fastest route. Another example of their autonomy is the robots’ capability to choose solutions when they encounter obstacles.

4.3.2 CASE 2 – FREKE

The robot and its role

Our second case deals with Boston Dynamics' Spot, a quadruped robot created for industrial and commercial usage (*Spot*, n.d.). Spot was gained access to through The Norwegian Defence Research Establishment (FFI) where the robot is referred to as Freke. At FFI Freke is used as a prototype to understand how it can be used in their concept of manned-unmanned teaming where autonomous robots play a central part. The idea is that Freke can be used to investigate areas that could be potentially dangerous to the soldiers. This requires an understanding of what functionalities Freke can and should have, as well as what functionality the robot already has. Freke could be seen as a tool for risk minimising and crucial in dangerous situations. This robot is fairly new and there are few of them in Norway.

Shape and form

Freke's form is inspired by animals in both appearance and movement. The robot can for instance resemble a dog in shape, but also a horse in its movement when it does trot-like movements. This design has led to a more stable and robust form. Freke has local movement in that the leg can bend and move the body up, down, and to different sides, and global movement back and forth and sideways.

IMAGE 2: FREKE AT OUR THIRD SESSION OF FIELDWORK.

The robot has different sensors and cameras to gather information about its surroundings. It has a 360 ° horizontal field view. It weighs approximately 33 kg and is around 70 cm tall and 110 cm long. The size is therefore big enough for the robot to be robust and small enough to move around in small places. It can also carry up to 14 kg (*Spot*, n.d.).

IMAGE 3: ILLUSTRATION OF FREKE'S SIZE COMPARED TO A DOG. PHOTO KRISTER SØRBØ / FORSVARETS FORUM

Use and use context

The highly developed software means that the robot is stable and can be used in a quite rough terrain, as well as indoors. Freke could be described as having a low degree of autonomy, as it is dependent on humans to control it. However, its ability to save an already walked route and handle lesser changes in its surroundings could be described as a higher degree of autonomy. Freke is controlled through a console with a screen connected to its cameras.

IMAGE 4: FREKE CAN BE CONTROLLED THROUGH A CONSOLE. PHOTO ANNIKA BYRDE / NTB

Freke has a flexible API that can be programmed and tailored to the user's needs (*Spot*, n.d.). For instance, the robot can be used at oil platforms to monitor and gather information from measurements. Still, Boston Dynamics has some strict guidelines regarding the usage and changes that are allowed to be made. Among other things, it is not allowed to place weapons on it.

Freke is currently used for research to investigate how a robot can be used as a teammate in a manned-unmanned team in a military situation. To get to this point, Freke needs to have software that facilitates situational awareness and increased autonomy. In addition, FFI needs to figure out how it should solve the tasks it is given, as well as how to communicate with the robot.

As the robot is thought to be part of a military team with both military personnel, drones, and autonomous vehicles, research into how it shall fit in with the military doctrine is necessary. Furthermore, it is necessary to decide the role of Freke operationally. For instance, could an unmanned ground vehicle (UGV) carry Freke to a said destination, like a building, and Freke could enter inside the building and report back. It would be ideal if Freke could get coordinates to a given position and get there without help or assistance from a human. This way the robot could replace military personnel in uncertain situations where there is a need to investigate. This could reduce the risk of potential harm to people.

4.3.3 COMPARING CASE 1 AND CASE 2

Both cases demonstrate aspects such as roles and work are affected by the technology in similar ways, although the robots themselves, as well as the context, are different. The cases consist of the two types of robots – Freke and domestic robots for vacuuming and lawn mowing – and their use context. We use them as means to understand how the experience of being with these robots can be described. We assume that the difference in the robots' forms, including their degree of movement, would affect how the robots are experienced. As mentioned, Freke could resemble a dog while the robots in case one are only a geometrical shape that moves around.

In addition, we believe that the difference in perceived autonomy might affect the experience. Both robots are to some degree autonomous; Both types of robots will try to avoid obstacles without the involvement of a human. Also, they can be given simple commands regarding their functionality and then complete them without more instructions. This way a domestic robot can be given instructions regarding when and where to clean and then do it without further human involvement. This is not the case for Freke. It needs someone to save an

already ‘walked’ route for it to be independent of someone controlling it. The domestic robots could be said to have a higher degree of autonomy than Freke, but the tasks that these robots accomplish are less complicated than the ones Freke does. Freke could – if viewed through the complexity of its task – be perceived as more complex than the domestic robots.

The greatest difference is perhaps how commercialised and common the technologies are. Domestic robots have existed in people's homes for many years, while Freke is new and something most people only have experienced through video clips. The robots in case 1 are almost a part of everyday life, while robots like Freke in case 2 are more common in special work contexts.

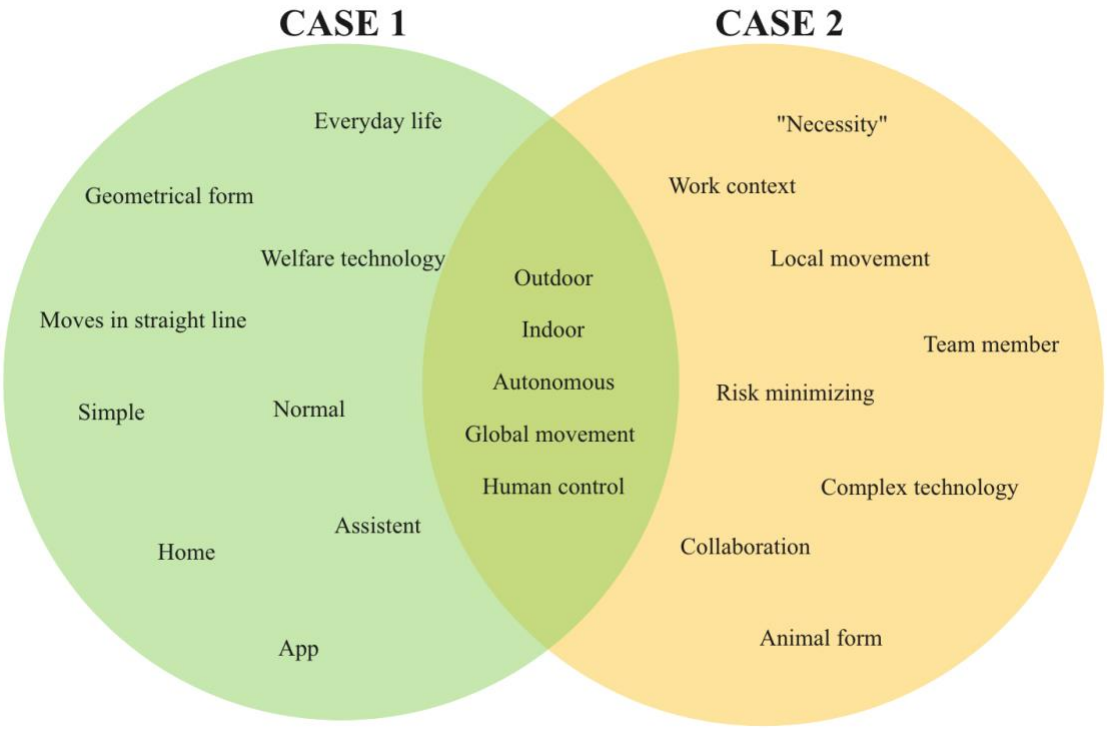

FIGURE 5: VENN-DIAGRAM OF THE TWO CASES WITH A FOCUS ON SIMILARITIES AND DIFFERENCES

4.4 VARIOUS METHODS FOR INVESTIGATING EXPERIENCE

4.4.1 ELICITATION DIARY

We wanted the participants to record their reflections related to the usage of their domestic robots – whether it was a vacuum cleaner, a lawnmower, or both. To obtain data related to this, we chose to use an *elicitation diary*. Elicitation diary is used in combination with interviews, where the diary is used as a foundation for the interview afterward (Lazar et al., 2017, pp. 135–152). We found this a suitable method as we were interested in the experience of a robot, which may be complex and difficult to explain and understand. Alaszewski (2006) argues that diaries provide insight into how situations are interpreted and how actions and events are ascribed meanings to and are understood by individuals. This was why we thought the diaries could be useful as a foundation for more in-depth interviews afterward.

In addition, diaries are often used to record reflections related to the meaning of activities (Lazar et al., 2017, pp. 135–152). The usage of diaries is preferred if the data is somewhat fluid, occurs at specific times and changes as the data needs to be recorded shortly after it has occurred to keep it as correct as possible (Lazar et al., 2017, pp. 135–152). Such data could for instance be feelings, perceptions, or responses to an occurrence. This can be difficult to remember after the activity has occurred.

Where surveys and observations are great for describing *what* people are doing, these methods are less effective at explaining and gaining an understanding of the motivation behind the action (Alaszewski, 2006; Lazar et al., 2017, pp. 135–152). A diary can facilitate this knowledge by gaining access to interpretation of the robot while it is being used, instead of trying to remember the experience. In our case, it was more useful to gain a deeper understanding of the experience from a few people, than to gain an overall insight from many. Furthermore, diaries allow for the collection of more detailed research than surveys, as the format of surveys often limits the flexibility of the informants (Lazar et al., 2017, pp. 135–152). We wanted to ask open questions where the informants could decide for themselves how much details they wanted to write.

4.4.2 IN-DEPTH INTERVIEWS

Following the diary study, we performed semi-structured interviews based on what was documented during the three weeks. This allowed the participants, and us, to clarify and elaborate on the experience and increased the likelihood of constructing an intersubjectivity (Crang & Cook, 2007, pp. 60–89). How one experiences a robot can be very subjective, and we believe interviewing increased the likelihood that we understood what our participants were interpreting. In addition, we could explain better what we wanted to understand, and thus make it more likely that we accomplished intersubjectivity. The notion of gaining a mutual understanding can be more difficult with for instance a survey and was important to us as the experience of robots can be difficult to explain. We chose to conduct in-depth interviews, something Walsham (2002) argues is an especially useful method to use for interpretative case studies, as it is a great way to gain informants' interpretations.

4.4.3 FIELDWORK

Because we suspected that experience related to robots was difficult to describe, we wanted to be in the natural setting of the robot interaction and talk about the experience *when it occurred*. We, therefore, wanted to conduct fieldwork inspired by ethnographic fieldwork. Ethnographic fieldwork combines observation, informal interviews, and participation in events that are happening in the context of interest (Blomberg, 1993). In addition to this, this approach to fieldwork contributes to the rich and extensive understanding ethnographers often have (Crang & Cook, 2007, pp. 17–33; Lazar et al., 2017, pp. 229–261). Our approach was similar, but because of the time constraints, we were not able to be immersed and carry out the data collection over a longer period.

The difficulty to describe experience can be similar to the difficulty of explaining tacit knowledge. Experiences can be difficult to gain access to and fully understand, but it can be easier when triangulating various methods. We believe that it could be possible to discover discrepancies between what people describe as their experience and what they actually experience. Fieldwork can provide access to tacit knowledge and information informants may not be aware of and therefore not able to explain.

4.4.4 WORKSHOPS

To further explore the experience of robots, we were inspired by Design Research and wanted to use the method Workshop. This method combines activities that entail telling, making, and enacting (Brandt et al., 2012), where the making could be seen as a way of creating 'things-to-think-with'(Brandt, 2007). We wanted to let the participants use tools such as post-it notes to help them express themself. The combination of telling and making can facilitate recollection regarding how each individual perceives and experiences a robot, as well as making it easier to explain something as abstract as experience.

4.5 METHODS FOR ANALYSIS

According to researchers, analysis is happening throughout the research process (Bratteteig, 2021; Crang & Cook, 2007). When doing research, the researcher will interpret what is seen and look for specific aspects that can help answer a research question. This is perhaps done automatically and makes analysis inevitable even while collecting data. For our project, we know that we want to systematise and describe the experience, therefore is it natural for us to focus on aspects that might be related to this topic. According to Bratteteig (2021), the information will, both during and after data collection, be interpreted and categorised based on what the researcher believes is relevant. Thus, in our case, we have already made some decisions about what is important to pursue during the data collection.

This process could be described as an informal analysis because we try to see patterns, how things fit together, and give meaning to the data, although done in an unsystematic way (Crang & Cook, 2007). This can be important to recognise because this may guide the further research process, with or without awareness. After the data collection has finished, the data material can be analysed with a more formal method of analysis, such as thematic analysis. This could be seen as a more formal stage where the data is looked at more systematically and carefully in order to see new themes and patterns (Crang & Cook, 2007).

When comparing different types of data from various methods of data collection, it can be useful to have a flexible method for analysing it. Thematic analysis is described as flexible by Braun & Clarke (2006). According to them, there are six steps to this method: 1) familiarise yourself with your data, 2) generate initial codes, 3) search for themes, 4) review the themes, 5) define and name themes, and 6) produce the report. We have been inspired by their way of thinking about thematic analysis. Having a systematic process like the one suggested by Braun and Clarke (2006) makes it easier to follow our argumentation and line of reasoning. As the topic of our research is exploratory and difficult to understand, it has been important to use a method that allows us to use the intersubjectivity we believe has evolved between us and the informants. This is how we interpret Braun and Clarke (2006) when they argue that one of the advantages of thematic analysis is that it allows for social and psychological interpretation of data.

4.6 SUMMARY OF APPROACH AND METHODS

We have now presented the theoretical and empirical background for this project. We have performed a multiple case study with an interpretive paradigm. To explore how robots can be experienced, we have combined various methods – elicitation diary, interviews, workshop, and fieldwork – to gather data. The analysis has been executed through thematic analysis. This has been done to find a way to systematise and describe the experience of being with a robot. How the project was executed in practice will be explained in the following chapter.

CHAPTER 5: COMPLETION OF THE CASE STUDY

This chapter presents how we have conducted the multiple case study. It will first present the methods used for case 1 and case 2, with a description of recruitment and execution. The chapter ends with a description of the ethical considerations and how these have been dealt with.

5.1 DATA GATHERING CASE 1 – DOMESTIC ROBOTS

5.1.1 DIARY AND FOLLOW UP INTERVIEWS

Recruiting

Participants were recruited through our social network. The only requirement for participation was that they had to own either a robotic vacuum cleaner or a robotic lawnmower. Factors like age, gender, work background, or where they lived were considered irrelevant. We wanted to understand what people experience and how this can be described, hence factors that could explain *why* – such as age or work background – were considered irrelevant.

We sent an email to ten potential informants with an information letter, including a consent form[2]. Five of our potential informants signed their consent form, but only three completed the diary study. These three were later interviewed to better understand their diary entries. Our questions and their answers became the foundation of a semi-structured interview guide in later interviews.

Execution

The diary study lasted for three weeks, where we wanted our informants to answer some predefined questions every time they used their robot. Lazar et al., (2017) recommend that this type of study should not last for longer than a week or two. However, we assumed that

[2] For consent form, see appendix V.

the informants would only use their robot 1-2 times a week, and therefore believed it would give us more data if they wrote for three weeks instead, without the diary being too much trouble. As preparation, we borrowed a robot vacuum cleaner and tried out the questions ourselves as a pilot. The pilot contributed to formulation of the interview guide for the follow-up interview. It also served as a foundation for understanding the diaries.

The questions were of a combination of open-ended and closed-ended questions. The open-ended questions provided external constraints. Lazar et al., (2017) state that such questions create space for the informant to answer in-depth and explore aspects that may be interesting in a way closed-ended questions cannot. Not all questions were mandatory[3]. We believed it would increase the likelihood for the participants to complete the whole diary study. Also, we were not sure what people would experience. Therefore, we wanted the participants to have the opportunity to write what they found interesting. the freedom to express opinions and responses without many

We chose to have open questions and let the participants choose for themselves how much they wanted to write. We evaluated if more detailed responses with the potential consequences of losing informants were more important than gaining less information with a reduced risk of losing participants. This could be seen as a trade-off. We argue that our choice could be justified by the fact that the diary was meant to be a foundation for the later interviews, and therefore the data did not need to be so elaborate.

Approximately a week after the diary was completed, we contacted the informants for follow-up interviews. These lasted about 30 minutes and were based on their response written in the diaries[4]. The interviews were conducted either physically or digitally through Zoom, with both of us present. We divided the work task so that both had responsibility for either doing the interview or taking notes and preparing questions for further elaboration. We decided to

[3] See appendix I for the questions for the diary.

[4] The interview guide can be found in appendix II

both write notes and record the interviews to capture gestures and body language as well as the spoken conversation. The interviews were recorded using UiO's Dictaphone application on Nettskjema.

5.1.2 INTERVIEWS

Recruiting

Informants with robotic lawnmowers did not participate in the diary study, as it took place at the beginning of autumn. We were told that the lawnmowers were either stored for winter or not used because of the weather conditions. However, we still wanted to gain insights from their experience in addition to the owners of robot vacuum cleaners. Therefore, we decided to perform in-depth interviews. We interviewed five informants. Four informants were contacted before the diary study, while the fifth informant was recruited after an informal conversation.

Execution

Interviews with the owners of the robotic lawnmowers were conducted similarly to the follow-up interviews after the diaries. They were conducted either physically or digitally through Zoom. All interviews lasted for approximately half an hour and both of us were present. One was responsible for actually conducting the interviews, while the other wrote notes and asked relevant follow-up questions. These interviews were recorded using an audio recorder.

Our first interview was heavily inspired by the insight from the follow-up interview after the diary study. We were aware of some of the informants' views about having a robotic lawnmower and used this knowledge when formulating the questions in our interview guide. Our interview guides evolved as we interviewed informants and started to gain more insight. We became less interested in how habits changed after introducing a robot lawnmower, and more about the experience and how the informants described it. At that time in our research, we could use the interviews more like it is used in ethnographic studies, to let informants

describe their version of events in their own words (Crang & Cook, 2007, pp. 36–59)(Crang & Cook, 2007, pp. 36–59). We better understood what we found interesting and how we could get our informants to provide this information[5].

5.1.3 FIELDWORK

We got the opportunity to observe the robot of one of the participants from the diary study. With this field trip, we wanted to observe the context and how the informant and her housemate interacted with the robot. This provided us with more insight into how this particular informant experienced her robot and supplemented our insight from the diary study. We intended to partake alongside our informant, but we were more passive because of the activities done during the fieldwork session. For instance, the informant had done laundry and folded the clothes as preparation for the robotic vacuum cleaner. This was an activity that felt unnatural to participate in. They also moved some chairs out of the robot's way while the robot was working. To participate in this would perhaps be disruptive. This resulted in us doing passive observation and informal interviews.

IMAGE 5: THE INFORMANT'S ROBOT VACUUM CLEANER 'CLEANO'

5.1.4 CHALLENGES RELATED TO CASE 1

We intended to record all interviews to ensure that we could go back and check the 'raw data'[6]. Because of GDPR, we had to use recorders that fit with these rules. We, therefore, used UiO's Dictaphone on Nettskjema. When going through the first five recordings, we noticed that most of the files were missing sound. For the remaining interviews we used a digital dictaphone instead. Hence, we only got to transcribe three interviews and had to base

[5] For a complete interview guide, see appendix II

[6] The data would not actually be 'raw data' as it would already been informally analysed

our analysis substantially on note. This was not seen as a severe problem, as we had taken extensive notes.

5.2 DATA GATHERING CASE 2 - FREKE

5.2.1 FIELDWORK

The fieldwork was conducted at two different places, three sessions in total. We frequently wrote down notes to grasp how our experience with Freke had been during each fieldwork session. This was useful in order to ask relevant questions and talk to other people about their own experiences regarding Freke. As experience is difficult to just observe or talk about, it has been useful to also reflect upon how we interpret and experience the robot to supplement our informants' statements.

Our first session consisted of us 'meeting' Freke for the first time. We got to observe how it moved and how people on the premises reacted to Freke moving around. We also got to control it ourselves. This allowed us to reflect on how we reacted to Freke's movement on different surfaces when we controlled it versus when someone else controlled it.

In the second session, the goal was to prepare for a workshop with video clips featuring Freke. We decided to record video clips demonstrating Freke's functionality because of the uncertainty related to COVID-19 and the somewhat limited access to Freke. The film clips were filmed in an outdoor area outside of FFI's premises, hence we did not film the use context. A side effect was that this allowed us to observe how random bystanders and dogs reacted to Freke. This facilitated short talks with different people about their immediate thought upon seeing Freke.

The third session was at a military demonstration of how autonomous robots, vehicles, and drones could be integrated into a manned-unmanned team in the Norwegian defense army. Here we focused on how Freke was perceived as well as how such a robot could be used. This session differs slightly from the two others. Here we talked to employees at FFI and students from the military academy. These informants were already familiar with the Boston Dynamic's robot and the use context, to some extent, but many had never seen Freke in real life. The previous session did not have the same framing of Freke's role in a manned-unmanned team. Therefore, this session showed us more what the context Freke is supposed to be used and allowed us to observe how the Norwegian Defence army views this robot.

IMAGE 6: FREKE ON THE UGV 'SIV' DURING THE MILITARY DEMONSTRATION

5.2.2 WORKSHOP

Participants

We chose to conduct a workshop to get a more in-depth understanding of how people experience Freke. The participants consisted of eleven men and women with various backgrounds, and ages ranging from 24-56 years. Some were recruited just for this workshop, while some had participated in the data collection for case 1. This resulted in a mixed group where some had experience with robots while others had not. Some had heard about Boston Dynamics' Spot and knew what it was, while others did not. None had seen the robot in real life before.

Execution

To demonstrate Freke and its functionality, as well as try to provoke reactions we had experienced, we showed three film clips. The first clip lasted for 3 minutes and 53 seconds and was intended to be an introduction to Freke. It illustrated Freke moving around, moving its body to resemble a dog, and jumping on two legs[7]. The second clip lasted for 2 minutes and shows Freke walking around in more challenging terrain in the woods and falling over at one point and slowly rolling down a hill. The third clip lasted for 50 seconds and shows Freke being pushed over by a man.

We performed a pilot before the actual workshop with two people. This was done to see if the questions we had prepared, and the video clips themselves made sense. The pilot-participants understood the tasks and expressed that they enjoyed the clips. Even though they were only two and knew each other, we believe we managed to check what we wanted. It was useful to test beforehand as we got the impression that the pilot-participants understood the tasks as we had intended. Hence, we did not feel we needed to change anything for the actual workshop.

During the workshop, we wanted the informant to include their own experiences related to other situations to better understand how they experienced Freke. To facilitate this, we split the informants into two groups. In between each film clip, each of the participants was to write down thoughts and reflections on individual post-it notes that were shared in the group. We told them to write down everything that popped into their heads, to have an 'everything goes' mentality. We believed it would make it less daunting to share with the group. When the groups felt they had discussed the contents of each post-it note, we asked the two groups to tell each other what they had talked about. This resulted in some interesting discussions between the group.

[7] When jumping on two legs, Freke would only 'use' the diagonal legs. For instance, the right front leg and the left back leg would touch the ground while the left front leg and right back leg would be elevated. This resembles a dance.

In the workshop, our role was facilitators for the discussions. We wanted the participants to discuss amongst themselves before they shared their experiences with the group, without too much involvement from us. We tried to keep a distance and only tried to ask questions based on what was already said. We cannot say that we did not influence the participants in any way, but we were conscious of it and tried to avoid it.

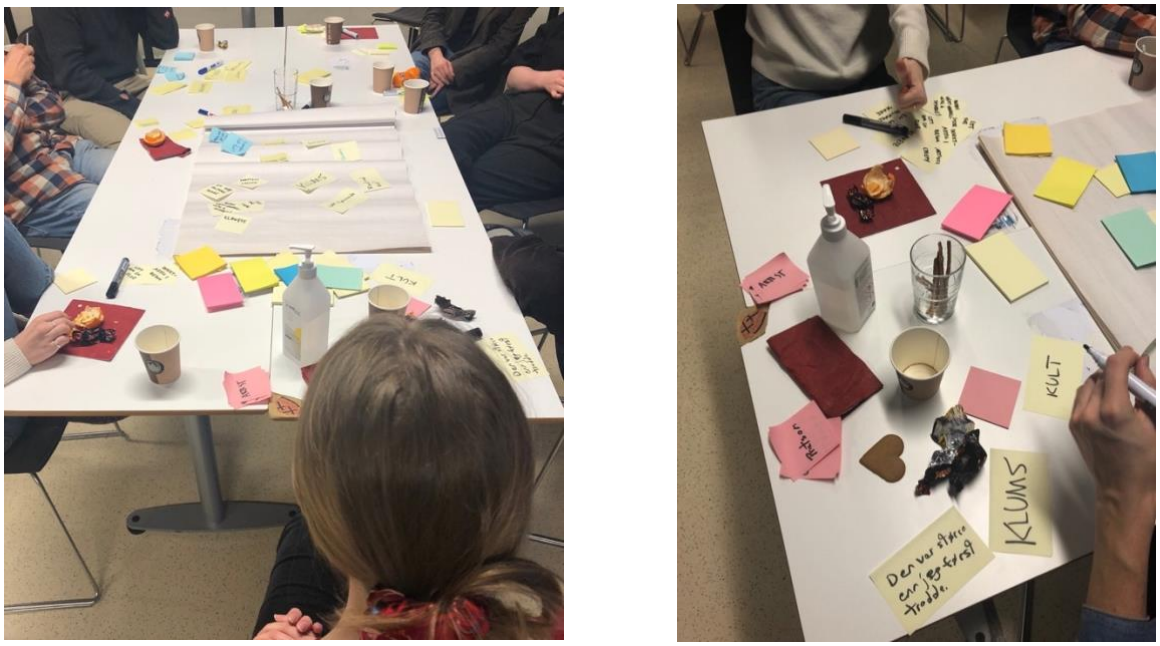

IMAGE 7: PICTURES FROM THE WORKSHOP. THE PARTICIPANTS DISCUSSED AND DESCRIBED THEIR EXPERIENCE OF WATCHING FILM CLIPS OF FREKE

We do not know for certain that the words and sentences written by the informants were the same as they would have been if they got to actually being with Freke. However, we believe that the insight gathered would still be valuable and interesting. In addition, the participants were informed that Freke belonged to FFI. This can also be visible on robots as it had a sticker with FFI's logo on its side. This might have influenced the perception of the robot.

5.3 ETHICAL CONSIDERATIONS IN OUR PROJECT

5.3.1 PARADIGM AND METHODS

As our paradigm is interpretive, we have used our own experiences and given meaning to our informants' reality. We have been aware of this throughout the whole process and wanted to be as transparent as possible for our informants. Thus, we have always tried to be open about what we are interested in and allowed them to read through our material regarding themself. In addition, we would argue that even though research methods such as diary and observation could be perceived as intrusive, we have strived to be clear about our goal for the data gathering. Our interest has always been the experience of robots, and not the informants per se. Therefore, we argue that we have tried to avoid gathering sensitive data that could be an issue for the informants.

As a sign of our appreciation for our informants' participation, we gave small presents including chocolates. Being aware of how monetary compensation can affect the study (Lazar et al., 2017) and due to economic reasons, we did not give something of much value. However, we felt it was important to show gratitude and that their participation was important to us. We believe we managed to find a good balance by providing a small gift and writing a personal card instead of just handing out vouchers. We also have the impression that the informants liked the token of appreciation and did not feel compelled to participate. In addition, some of our informants were acquaintances of ours, which can affect how the informants feel about participating. We believe however that we were clear that it was voluntary and that it perhaps made it easier for the informant to feel comfortable.

5.3.2 INFORMED CONSENT AND ANONYMITY

Before starting the data gathering process we gained informed consent from the informants[8]. This was sent by email, which was used as our communication channel. We made an overview of all the participants on Google Drive, but the system for how we coded the participants was agreed on orally and never written down. Anonymisation throughout the

[8] See appendix V for the consent forms

writing process has been done by using codes and fictional names for places and informants to prevent the mosaic effect – where the combination of various information together makes it possible to identify an informant (Lazar et al., 2017). Therefore, we would argue that we ensured a satisfactory level of anonymity and security for our informants.

5.3.3 STORING DATA

It was important to start our data collection early so we applied to NSD in the summer of 2020. We managed to get approval from NSD shortly after the application was sent[9]. In our application, we specified that we only intended to collect data that is classified as 'limited', or 'yellow' by the University of Oslo. This classification is used if the data could cause damage to an institution or collaborators if the information is made known to unauthorised people, and is only relevant for a limited user group associated with the university or institutions and organisations the university collaborates with (Universitetet i Oslo, 2020). Furthermore, we specified how we intended to collect and store this data. The storage would be at UiO Google Suite for Education, which – according to UiO (Universitetet i Oslo, 2021) – is suitable for data with this classification.

5.4 SUMMATION OF EXECUTION

We have now presented how our project was executed. Case 1 started with a diary study followed by in-depth interviews with users of both robot vacuum cleaners and robot lawnmowers. We also did a brief fieldwork session in the home of one of the participants. In case 2 data was collected through fieldwork and a workshop. Lastly, we described how we have handled the ethical considerations.

[9] See appendix VI for approval

CHAPTER 6: ANALYTICAL MAPPING OF ROBOT EXPERIENCE

This chapter presents our analytical process and our findings related to this. We will describe how we created our analytical framework – Analytical Mapping of Robot Experience (AMoRE) during our analysis of case 1. This framework was further used when analysing case 2, too further systematise and describe the experience of being with a robot. The chapter ends with a comparison of the experience in the two cases, using the dimensions of AMoRE.

6.1 HOW WE ANALYSED CASE 1 – DOMESTIC ROBOTS

6.1.1 THEMATIC ANALYSIS OF CASE 1

As previously mentioned, during case 1 we conducted a diary study, in-depth interviews, and fieldwork. When we talk about the analysis of case 1 we mostly mean the data material gathered from the diary study and in-depth interviews. This is because the data gathered during the fieldwork was not written and it was, therefore, difficult to perform a thematic analysis. Still, it has been informally analysed and the result has been part of the further process. The diary and in-depth interview were analysed separately before we analysed them as one case.

6.1.2 FIRST ITERATION: INFORMAL ANALYSIS

We call this our first iteration of analysis because these activities made it clearer for us what we were looking for and affected how we continued our process. Crang & Cook (2007, pp. 36–59) argues that because of the way data is constructed in qualitative research, one cannot look at the data as raw. It has already been partly analysed. Already before and during the interviews, it can be argued that one is analysing because of choices taken related to the interview e.g., what to focus on during the interview.

When we wrote notes during the interviews based on what we found interesting, can be viewed as informal analysis. After our data collection, we discussed, wrote down interesting aspects, made mind maps, and tried to sort out what we found interesting. This process could also be described as an informal analysis because we tried to see patterns, how things fit together, and give meaning to the data, although done in an unsystematic way. This is coherent with what Crang & Cook (2007) describe and informal analysis. An informal analysis can be important to be aware of, as it may influence the further research process.

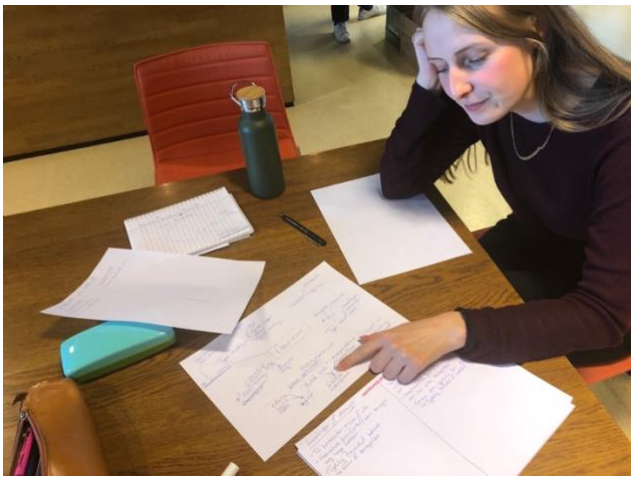

IMAGE 8: DISCUSSING OUR EXPERIENCE AFTER FIELDWORK

Because of the challenges we encountered in case 1 with the audio recorder, we had to base our analysis mainly on notes and not transcriptions. Hence, we could not focus on the linguistics and formulations of the informants. We have however focused more on the meaning of what is being said, trying to find the essence. This could have affected validity and reliability as it could be challenging to trace our reasoning. But validity and reliability are usually not the focus of interpretive research (Crang & Cook, 2007). Hence, we did not view this as a hindrance. We are aware that we are not objective, and instead use our subjective interpretations to understand a part of the phenomenon we are interested in.

6.1.3 SECOND ITERATION: CREATING CODES AND THEMES

In our second iteration, we performed a thematic analysis in Miro. To do a more systematic analysis we went through the diaries and interview notes and created codes. The codes were based on what we thought was interesting and are in line with our paradigm. We both analysed data from one participant separately, and one participant together. Then we went

through our codes together to see if anything was missing or unclear. We also sorted the data into themes, and by doing this found patterns that made sense to us[10].

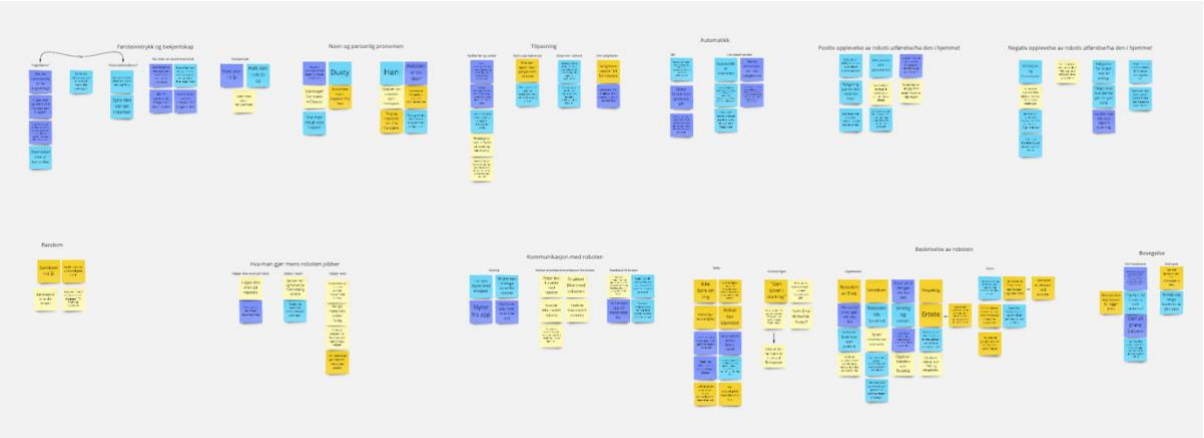

IMAGE 9: THEMATIC ANALYSIS OF CASE 1

6.1.4 THIRD ITERATION: ANALYSING WITH LENSES

Our third iteration was also formal and structured. We had a deductive approach where we wanted to look at the data with the themes we had discovered in our previous iterations. We discovered that the themes could be sorted into two categories: Engineer/Tool and Storyteller/Otherness. Using these lenses helped us to better understand how people talk about their experiences and allowed us to experiment on how this experience could be described.

[10] For further details about the themes, see appendix III.

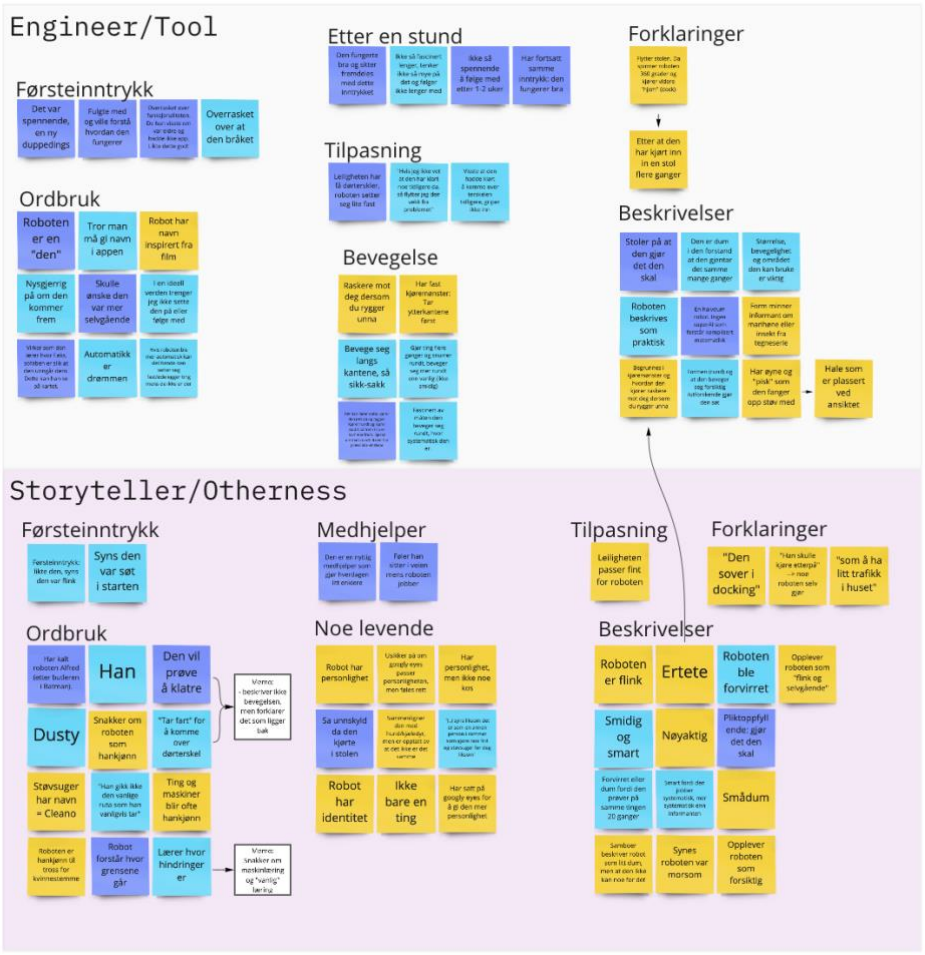

IMAGE 10: ANALYSIS OF CASE 1 AFTER SECOND ITERATION

As a result of the categorisation between Engineer/Tool and Storyteller/Otherness, we interpreted the data as two ways of expressing and looking at the robots. For instance, in the second iteration, we found the themes ‘Name and personal pronoun’ and ‘Control’ (in Norwegian *‘Styring’*). We saw our themes as part of a hierarchy with a clear separation and aspects related to the experience. The two ways of talking about the robots and the themes we identified could therefore be sorted using the two lenses Engineer/Tool and Storyteller/Otherness. The post-it notes were sorted by what we perceived the post-it represented with the lenses in mind.

6.1.5 FOURTH ITERATION: ANALYSING THROUGH AMORE

The analysis was an extension of how we analysed it in the third iteration. We noticed that the categorisation from the third iteration, Engineer/Tool, and Storyteller/Otherness, could be divided to separate between perception and description of the robot. 'Engineer' was changed to 'Pragmatist' as this was interpreted as more fitting. This resulted in the two axes Tool-Otherness and Pragmatist-Storyteller that make up AMoRE. These axes were used to create four dimensions of experience: Metaphor, Moreness, Technical, and Co-presence. The separation was done to investigate how the robots were perceived and what lens was used to describe the experience. From this point in our analysis, we used AMoRE in multiple shorter iterations.

We used our own experience to interpret the data and tried to understand the meaning behind the themes and codes. Therefore, we also did a lot of comparisons and thought about how we would talk about a tool like a hammer compared to a friend. To investigate our categorisation, we also asked people informal questions about how they would describe a friend compared to how they would describe a tool. This way, we got a better understanding of how people can describe living entities and objects differently.

6.2 OUR MAIN FINDING: AMORE

Before we go further in this chapter, we will describe AMoRE, our main finding from case 1. This will make it easier to follow the analytical process and how we use AMoRE to describe the experience. In order to answer our main research question *Is there a way to describe the experience of being with a moving non-social robot? (RQ1),* we needed to answer *How can the experience of being with a moving non-social robot be systematised? (RQ2).* We argue that AMoRE is an analytical framework that can be used to systematise the experience. This systematisation can be used to describe the experience.

6.2.1 WHAT IS AMORE

AMoRE is an analytical framework for mapping qualitative data on how humans experience robots. Researchers – whether they are designers, robophilosophers, or engineers – can use this framework to map out an interpretation of informants' experience. It is meant to be used as part of an iterative analysis. There are three main parts when using AMoRE: Get to know the data, Sort the data into the dimensions and interpret the distribution of data. We look at the analysis as an iterative process. The order can therefore change according to needs.

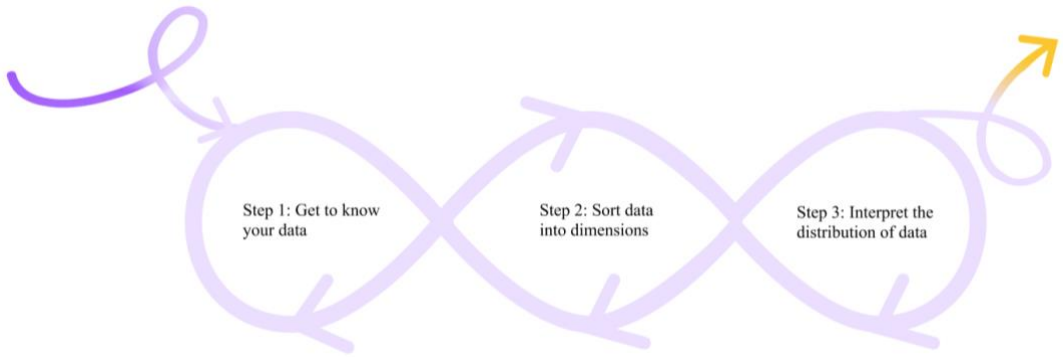

FIGURE 6: ILLUSTRATION OF HOW AMORE CAN BE USED IN AN ITERATIVE PROCESS.

AMoRE consists of two axes where one illustrates linguistics while the second illustrates how a robot is experienced. Together the two axes create a four grid chart with four extremes: Tool, Otherness, Pragmatist, and Storyteller. The four extremes are based on our theoretical framework (chapter 3) as well as our first iterations of analysis of case 1.

6.2.2 THE FOUR EXTREMES

We see the axes as two continuums where the extremes are opposites. During our analysis, we decided that experience could be looked at as a combination of how a robot is perceived and how the experience is talked about. According to the definition we use for experience, humans' thinking patterns, previous knowledge, and perception are a part of the experience, together with motivation and emotional state. The distinction between how humans speak and perceive could be seen as artificial since they can influence each other. For instance, could perception and how it is described be influenced by previous knowledge. It is, however, necessary to simplify the complexity of experience.

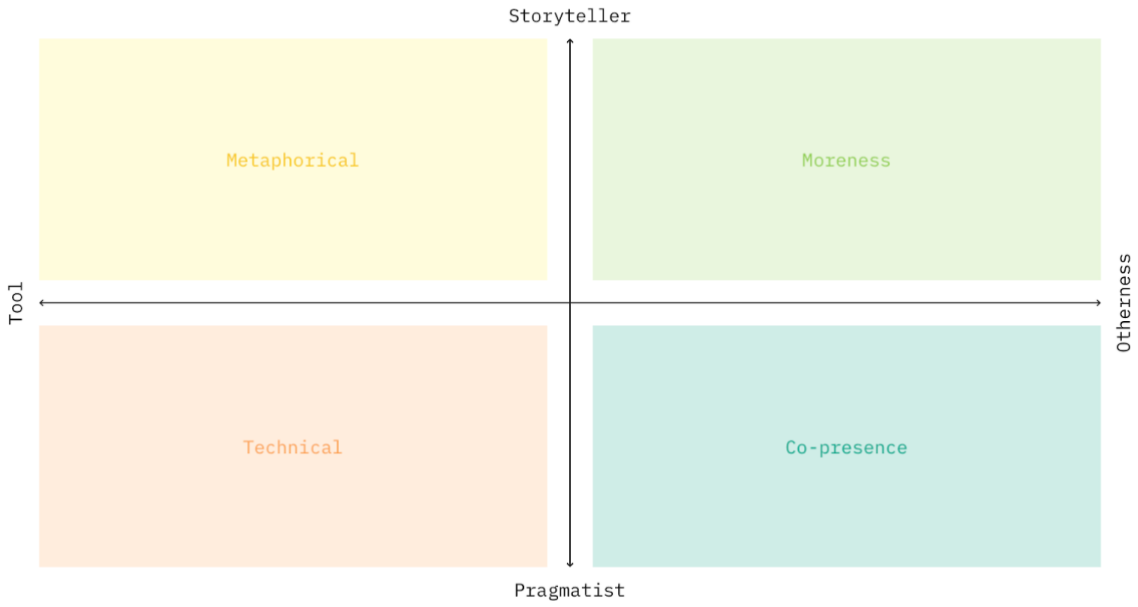

FIGURE 7: THE DIMENSIONS WITHIN AMORE

In the following subchapter, we present our thoughts on the extremes that make up AMoRE. Similar to how Phillips et al. (2012) uses continuum to describe how a robot can be perceived and talked about as a tool, teammate, or something in between. We would argue that the experience of being with a robot could be described using a similar continuum.

Tool to otherness continuum

On the horizontal axis, we have placed the extremes that represent how people perceive robots as Tools or Otherness. Our framework uses the concept of 'tool' to include everything that assists humans in their tasks to achieve a goal. Our definition of a tool is loosely based on Marriam-Webster's definition: "something (such as an instrument or apparatus) used in performing an operation or necessary in the practice of a vocation or profession" (Marriam-Webster, n.d.). We do not think a tool needs to be used only as part of a vocation or profession. Therefore, our definition of a tool also includes Heidegger's understanding of equipment, where tools could be seen as 'something-in-order-to'. Living actors such as humans and animals do not fit into our understanding of tools. We understand the 'usage' of e.g. humans as manipulations and is not the same as the usage of tools.

We believe tools, and other objects, in many situations, are perceived as only tools and nothing more. However, there are instances where objects such as robots or boats, are being anthropomorphised or sociomorphised. In such instances, the objects could instead be interpreted as something more than just tools. We have chosen to describe such interpretations as an otherness. We do not believe perception to be dichotomous. Rather a gradual transition from tool, through the perception of otherness, towards a perception of aliveness.

We would argue that if the perception of the robot is something more than a tool, the robot would classify as an otherness. This is consistent with how Ihde (1990) uses otherness. He argues that any relation humans have with something other than themselves would create a perception of otherness. For example, a cat would perhaps initiate a feeling of animal otherness. We decided not to build upon these different types of otherness that Ihde (1990) distinguishes between. It was more important for us to illustrate the nuance of otherness as a gradual shift from objectness toward the experience of aliveness.

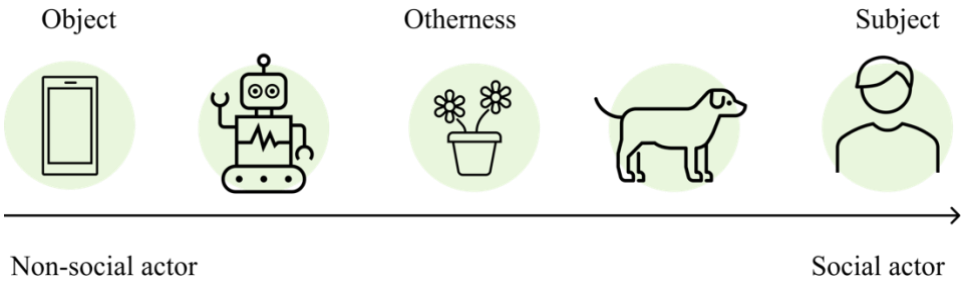

FIGURE 8: ILLUSTRATION OF THE NUANCE OF OTHERNESS AS A GRADUAL SHIFT FROM OBJECT TO SUBJECT.

We discovered that our informants perhaps perceived the robot as something more than just an object, but never as something alive or an actual ‘other’. We interpret this as the robot having a ‘layer’ of something more than a tool. This layer is what we have named ‘otherness’. The layer of otherness can exist to different degrees, where we imagine that the

most extreme would be perceiving a subject, as something alive. However, we chose to not use ‘aliveness’ as it can be misleading in this project. Our focus is the perception of the robot as something other than an inanimate object, like a tool. The perception is not necessarily something alive, but perhaps something in between inanimate and animate.

The Pragmatist to Storyteller continuum

On the vertical axis, we have placed the extremes that represent the ‘style’ of how people talk about robots: the Pragmatist and the Storyteller. These extremes are meant to illustrate the diversity of how one can talk and describe the experience of being with robots. The Pragmatist view is factual and describes more concretely with a technical language what the experience is. Our understanding of a technical language is based on how Winter (2019) uses this term. We build upon this and include concrete descriptions of what is objectively happening or possible to see. This is in contrast to the other extreme in this continuum, the Storyteller.

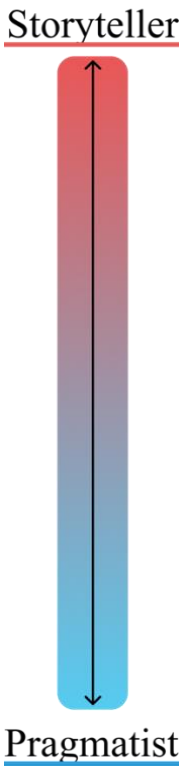

FIGURE 9: THE PRAGMATIST-STORYTELLER CONTINUUM

The Storyteller uses more metaphors and linguistic pictures to transfer more emotional and personal experience in the descriptions and describes more than what perhaps can be objectively observed. The descriptions could be a result of giving intention to objects. Furthermore, the Storyteller is also inspired by the research on perceptual causality and animacy, where it has been found that people often create meaning or stories based on little information (Gao et al., 2009; Heider & Simmel, 1944; van Buren et al., 2017) (see chapter 2.2 for more details).

Similar to the tool to otherness continuum, we believe the style people use when expressing what they experience can be looked at as a continuum. Humans are not either a Pragmatist or a Storyteller but could have variations of both. These variations could be difficult to distinguish from each other, which further strengthens the use of a continuum.

6.2.3 THE FOUR DIMENSIONS

The two continuums form four dimensions that illustrate dimensions of experience. Each dimension could be viewed individually to understand an event or some part of an interaction, or together to view the experience more holistically. The four dimensions are Metaphorical, Technical, Moreness, and Co-presence.

Metaphorical dimension

This dimension is based on the combination of perceiving the robot as something towards a tool and talking about the perception in a way that is toward a Storyteller. In this dimension, the analyst interprets that the robot is perceived as something technical and a means to reach a goal. However, one may still talk about the robot as something living even though the perception is that of a tool.

We have named this dimension ‘Metaphorical’ because we find that this is how people often describe such an experience. Similar to how Larkoff & Johnson (1980). explain that humans use metaphorical concepts to understand and structure what they do, we also believe humans can use metaphorical concepts to understand robots and the experience of being with them. As mentioned in chapter 3.1, metaphorical concepts are often based on previous experiences and what one is familiar with. This could create the foundation for humans to understand each other when describing what a robot does and why. For instance, one could say that a vacuum cleaner loves to eat socks. Vacuum cleaners do not have a digestive system or gain energy from eating socks. Rather, it is a pictorial representation of how the socks often get sucked into the vacuum cleaner.

Technical dimension

We have called this the Technical dimension because the robot is perceived as nothing more than a technical device and is also described that way. As with the 'Metaphorical' dimension, the robot is perceived as a technical measure that is used to reach a goal. Contradictory to the 'Metaphorical' dimension, the description is in the Pragmatist style and reflects the technical perception. The descriptions are not so much open to interpretation, instead, it is very specific and observations are described more directly. For example, the appearance of a robot could be rooted in its geometrical shape, while the robot's movements can be described as "having a fixed driving pattern where the robot starts with the outer edges of the room and then drives in a zigzag pattern".

Moreness dimension

We have chosen to call this dimension Moreness because it refers to how the robot is interpreted as something *more* than a tool and the experience is expressed by descriptions of *more* than what is objectively observable. The Moreness dimension is based on the combination of perceiving the robot as something towards an otherness and talking about the experience in a way that is towards a Storyteller. In this dimension, experience is expressed using anthropo-, zoo-, and sociomorphic descriptions, as well as linguistic pictures. The usage of such descriptions can imply the experience of the robot as something *more* than a tool, as the descriptions refer to attributions of aspects like emotions and intentions. That way, the robot could be experienced as well behaved, having a personality or cunning. Such words are not used to describe the experience of using a hammer or other less complex tools but are perhaps more natural to use when talking about a robot.

The experience of the robot as 'something more' is based on subjective interpretations of the robot, which the language reflects. The perception is towards something that can be interpreted as being alive perhaps with human- or animal-like qualities. As mentioned previously, we do not think that the experience is that the robot actually is alive, but towards something that can be interpreted as animate.

Co-presence dimension

We have called this dimension Co-presence because the robot is perceived as something you can be with, a co-presence. We argue that you would not say that you can 'be with' something that is not perceived as an otherness; The feeling of co-presence with an otherness is not the same as being in the same room as a chair for instance. This corresponds with how Seibt et al. (2021) describe the notion of 'types of experienced sociality' (TES).

The dimension Co-presence is a combination of experiencing the robot as something towards an otherness and talking about the experience in a way that is towards a Pragmatist. The descriptions of the experience are rational and sober, with a focus on what can be objectively observed, but are not limited to this. In this dimension, the descriptions of the robot tool-like, but when explaining e.g., how it is to be around the robot, the perception of otherness becomes apparent. For instance, feeling a need to apologise to a robot vacuum cleaner for being in its way, while using sober descriptions, could indicate a Co-presence experience.

6.3 HOW AMORE WAS USED TO DESCRIBE THE EXPERIENCE IN CASE 1

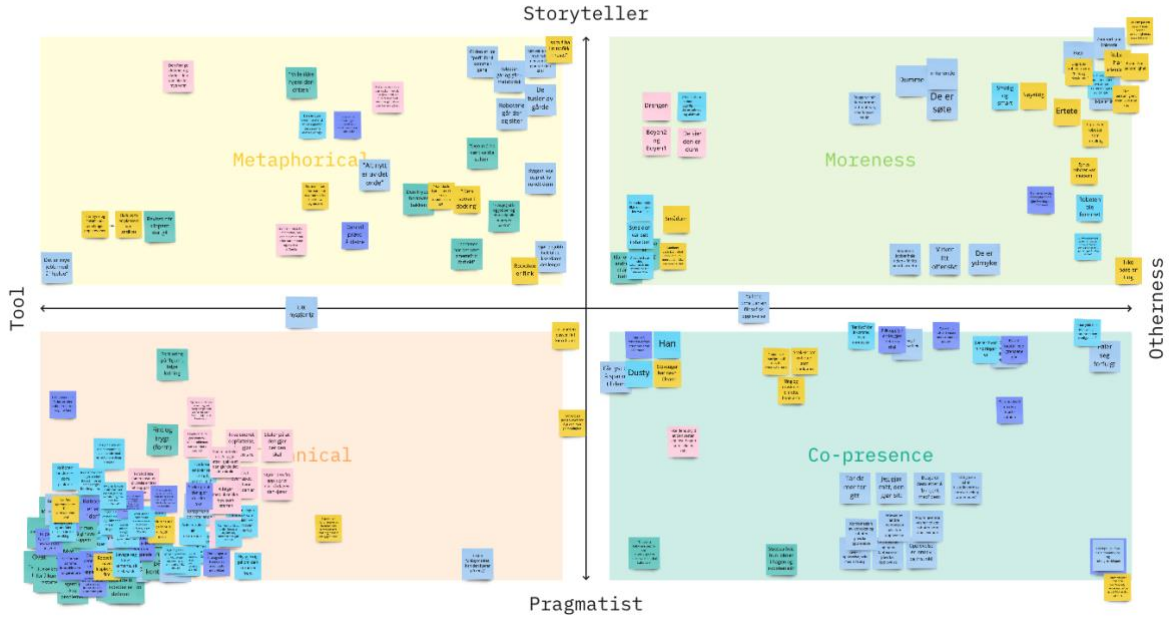

IMAGE 11: ANALYSIS OF CASE 1 WITH AMORE

6.3.1 THE TECHNICAL EXPERIENCE

Looking at the picture, we see that there are most post-it notes in the technical dimension. Hence, we interpret this as the experience being mostly Technical. We interpret that our informants perceive the robotic vacuum cleaners and lawnmowers as tools. They also talk about the robot from a Pragmatist perspective. One informant said that the robot moved systematically, which she found fascinating. She used a technical language and described the robot's movement like this: "And now I don't quite remember the pattern, but it always sort of goes around the room, and then zig-zag or s-shape one way, and then it goes in an s-shape the other way"[11]

[11] See appendix IV for an overview over translated quotes.

We interpret the fascination as grounded in the ability of the technology to adapt to the layout of the room. She explained that when her robot first encountered the living room table, it 'learned' that it was an obstacle at that position. The movement of the robot was also described using a Pragmatic lens, not a Storyteller lens. Therefore, we believe she perceived the robot more like a tool, as we interpret that her fascination is with the technology.

Many of our informants told us about their first impression of the robot, how the robot works and how they experienced it as working well. The lack of change, as well as the focus on functionality and 'something-in-order-to', leads us to believe that they look at the robot as a tool rather than an otherness.

6.3.2 OTHER DIMENSIONS OF THE EXPERIENCE

At the same time, we have also found that informants talked about their robots using metaphors. We interpret that the informants view the robot as a tool but use a more colourful language to describe their experience. This can however be difficult to interpret, as the usage of metaphors is a part of the way humans speak (Larkoff & Johnson, 1980). We have tried to see what they say in a context as well as pay attention to their way of wording. For instance, one informant said she was very conscious about how she used the robot lawnmower and did not want to give it a name. At the same time, she also described it as 'not wanting to go home'. We interpret the usage of 'home' as a structural metaphor, where 'home' is a metaphorical concept for the docking station. We do not believe that she felt like this was literally the robot's home, but a figure of speech. The combination of a Storyteller style and the perception of the robot as a tool indicates a Metaphorical experience, as it corresponds with a Metaphorical dimension that is a big part of the experience as a whole.

Although the perception of the robot is mainly as a tool, we see that some post-it notes fall under the Moreness and Co-presence dimensions. This could mean that the informants view the robots not only as something technical but as something *more*. If the robot was perceived as just a tool, we would perhaps not see examples of the informants talking about personalities and being uncomfortable around it. For instance, one informant said explicitly that she believed the robot had an identity and a personality. She had put 'googly' eyes on her

robotic vacuum cleaner but was unsure if that was consistent with the robot's personality. This could have been an example of ontological metaphor and personification, but we interpret that the participant actually experienced this. We do not think the informant would feel that way if she genuinely experienced the robot as just a vacuum cleaner and a tool but perceived the robot as an otherness.

In addition, during the pilot before the diary study, Runa experienced feeling impressed and was genuinely happy because the vacuum cleaner managed to 'climb' over the threshold. She had a feeling that the robot was struggling with the thresholds. When it suddenly was in the kitchen with her, she was surprised and happy on behalf of the robot. The fact that she felt joy on behalf of the robot suggests that she had an experience of an otherness. In addition, she described the experience using words that suggest she saw something more than just a tool moving around. Both Runa and the informant that used 'googly' eyes on her robot could be described as having a Moreness experience because their descriptions and perceptions correspond with the Moreness dimension.

We interpret some of the informants' descriptions as more pragmatic, where they focus on the technical aspect and functionality. However, we assume that their perception is not a tool based on what they said and how they said it. Hence, we describe their experience as Co-presence. We see examples of the robot being perceived as an otherness but talked about using a Pragmatist lens. This is in contrast to the Metaphorical dimension, where the robot is perceived as a tool and talked about in a Pragmatist style. For example, one informant described how he had felt after arriving on an island where there were no other people except him. There were however robotic lawnmowers there:

> Normally, I would have liked to arrive at a deserted island, without people and feel the freedom of being alone there. But there were like thirty lawnmowers on lawns that 'buzzed' and drove around. It created this presence that felt different in regard to the fact that there was no one there.[12]

[12]See appendix IV for an overview over translated quotes.

To us, this quote is a good example of the Co-presence dimension. We interpret the quote as genuinely experiencing the robots as more than tools. Especially since the informant described, in the fashion of a pragmatic person, that he felt robots are different from other technical tools like an automatic light: “Or a light that switches on and off, that’s also kind of the same thing, but with these robots it, so it is those “cutters”, so to me it is a very different and a bit peculiar experience.”

6.3.3 MIXED EXPERIENCE BETWEEN AND WITHIN EACH INFORMANT

We discovered that almost all informants describe the robots as both something technical and towards an otherness. Therefore, we do not believe that humans either perceive the robot as a tool or an otherness. Rather, we assume that both perceptions might be present, but perhaps to different degrees. To us ‘mixed experience’ refers to the presence of more than one dimension and could indicate a conflict of either perception, lens, or a combination of both. We do not have the foundation to say that the mixed experience happens simultaneously. We do however know that our data indicate that the notion of being with could be described with more than one dimension at the same time.

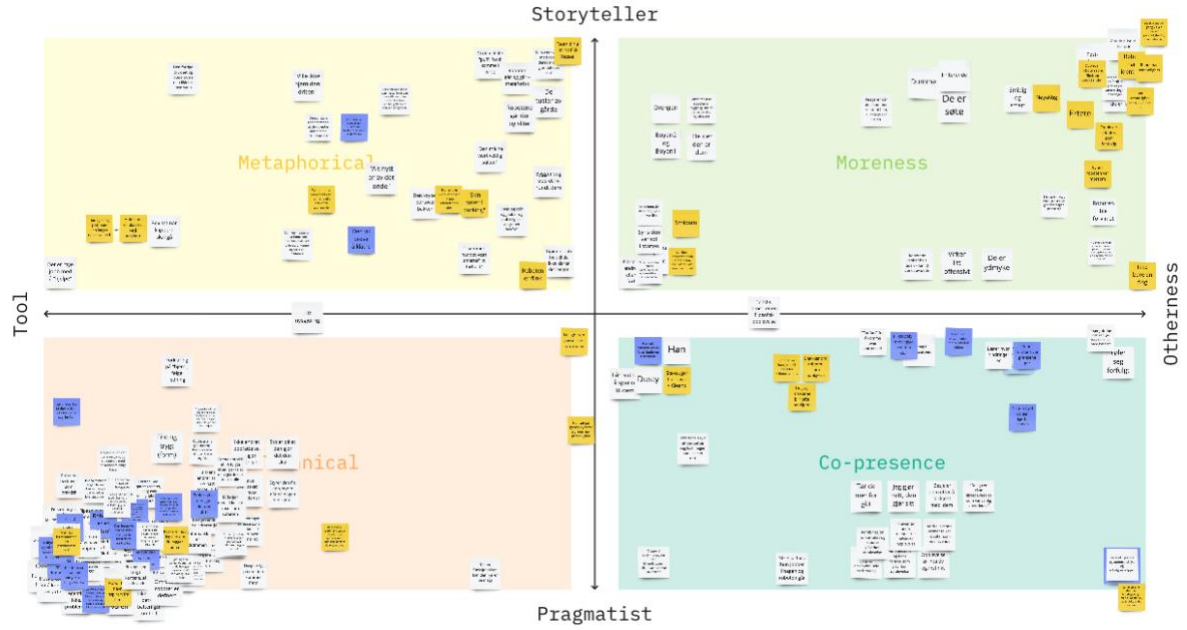

IMAGE 12: ILLUSTRATION OF DIFFERENT EXPERIENCES ACROSS PARTICIPANTS. PARTICIPANT 'YELLOW' APPEARS TO HAVE A MORE PROMINENT MORENESS EXPERIENCE, COMPARED TO PARTICIPANT 'PURPLE'

Image 12 shows that one informant (her post-it notes are yellow) talked more about the robot as something *alive*, which resembles the perception of an otherness. For her, it made sense to name the robot because she perceived that it had an identity. Hence, we interpret her experience as Moreness. However, when she compared the experience of having a robot to having a pet, she is clear that it is not the same. Her explanation is sober and could be understood as the Pragmatist view. She would cuddle her pet but does not feel the same appeal to do the same with the robot. To us, this illustrates the experience of Co-presence, as she describes her experience of being in the same room as the robot as a Pragmatist, while her perception of the robot is otherness.

As the previous examples illustrate, we interpret the experience of robots as mixed within each subject. There are also mixed experiences between the informants. One informant (his post-it notes are deep purple) does not talk about the robot as something *alive* with a personality or identity, but more about the robot as something technical. He mostly uses technical language and appears to have a Pragmatic style when talking about the robot. This is very different from how the previous informant describes and perceives her robot. Even though both have a robot vacuum cleaner, the experience seems to be very different. This appears to be true for the owners of robotic lawnmowers as well.

6.3.4 THE EXPERIENCE OVER TIME

During our analysis, we noticed that our informants talked about how they experienced their robot differently based on how long they had owned their robot. Most informants told us that they paid attention to the robot in the beginning, but that they lost interest after a while. Our informants justified this as concern about the robot being damaged or getting stuck. One informant said that when he would observe his robot, he was interested in the functionality and how it worked. Now he does not even feel the need to be home to overlook the vacuuming robot. Furthermore, in the interview when we asked him if he had noticed a change in his experience of the robot:

- Never really thought about it as anything other than what it is

- Which is?

- A robot vacuum cleaner. A semi-stupid robot. No super AI that understands complicated mathematics. It is useful as a helper that makes daily life easier.[13]

Although his view of the robot remained the same, his interest in it changed after one to two weeks. He compared the loss of interest to watching someone banging their head against a wall. He would be interested in what was happening but lose interest when he would feel he understood what was happening. Another informant still observes her robot after six months, finding it interesting but maybe not as much as in the beginning.

[13] See appendix IV for an overview over translated quotes.

6.4 HOW WE ANALYSED CASE 2 - FREKE

As previously mentioned, case 2 consisted of fieldwork and a workshop. As with case 1, the fieldwork was informally analysed and influenced how we interpreted the data from the workshop. The analysis described in this section is based upon the data material gathered from the workshop. Similar to the analysis of case 1, this analysis has also been done in iterations.

6.4.1 FIRST ITERATION: ORGANISING DATA INTO MEANINGFUL CATEGORIES

During the workshop, we asked the participants to write on post-it-notes. Therefore, it seemed natural to start the analysing process by organising these notes. The post-it notes were sorted by the film clips to see if the 'story' shown in the film clips affected the descriptions. It also helped us understand the meaning behind the descriptions as they often were single words and not full sentences.

Some of the participants had already done some organising while they discussed their post-it notes. We felt their grouping made sense and decided to use this as a basis for our analysis. During this analysis, we identified themes like *technical associations*, *positive associations, movement, autonomy, function,* and *changing experience.*

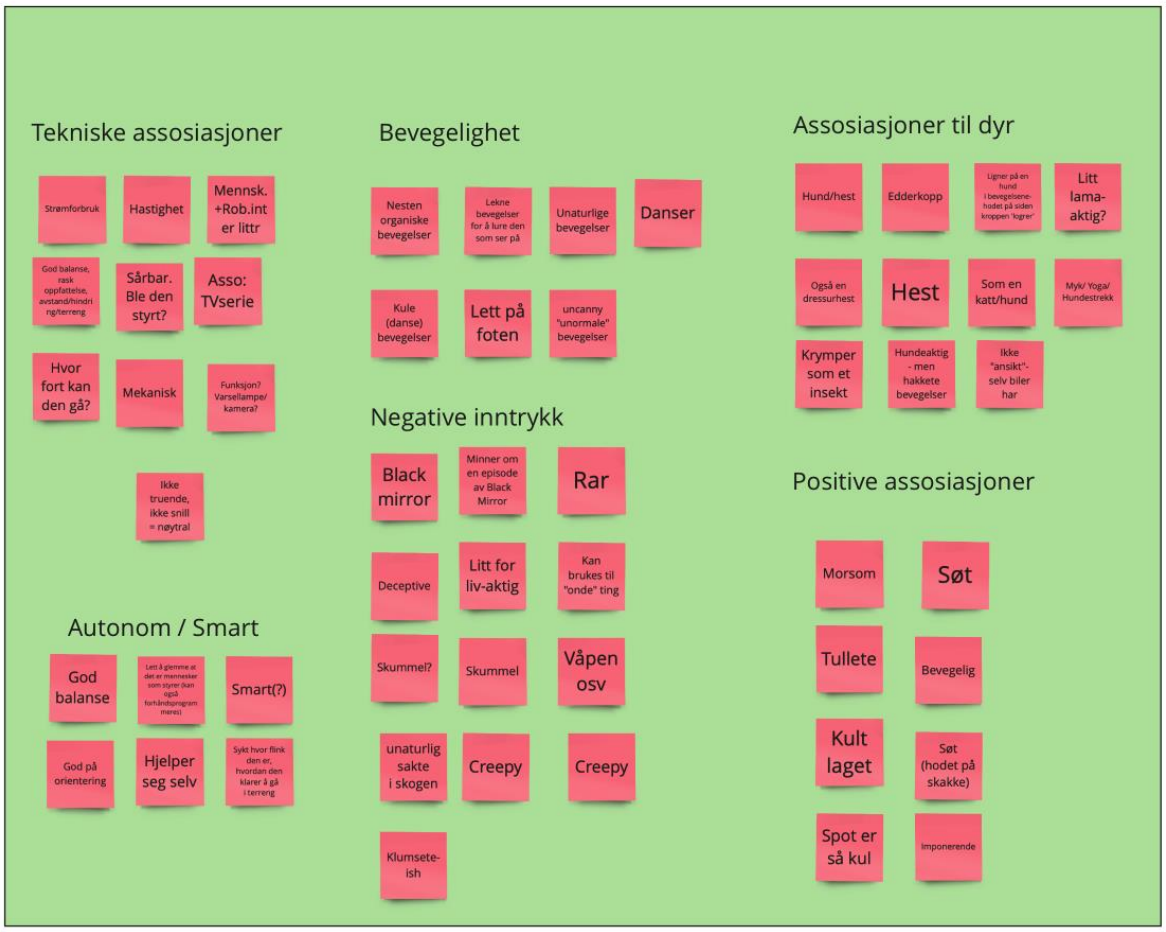

IMAGE 13: ANALYSIS OF CASE 2 AFTER THE FIRST ITERATION. THE IMAGE ILLUSTRATES OUR GENERATED THEMES [14]

[14] The categorisation for all three film clips can be found in appendix III.

Film clip 1	Film clip 2	Film clip 3
Technical associations	Associations	Associations
Positive associations	Descriptions of Spot	Reactions
Associations to animals	Size	Descriptions
Movement	Movement	Form
Autonomous / Smart	Action	Functions
Negative impressions	Autonomy	Comments
	Functions	
	Change in experience	
	Comments	
	Questions	

TABLE 1: LIST OF ALL GENERATED THEMES SORTED BY FILM CLIPS

While organising the notes we also wrote our notes with our thoughts and associations of information that we found interesting. We noticed that people described what they had observed using their body language and facial expression. For instance, how participants used their bodies when illustrating what made the robot look like a dog. We assume we can interpret their demonstration as a way of showing what they have ‘seen’. Perhaps not what the robot actually did, but how the participants interpreted it. They used their facial expressions to demonstrate how Freke acted, even though it does not have a face. We interpret this as the participants' ‘meaning-making’ of the robot’s movement and perhaps seeing more than what is objectively happening.

6.4.2 SECOND ITERATION: ORGANISING ACCORDING TO OUR FRAMEWORK/MODEL

When the data had been organised into categories, we started sorting them according to our framework. We believed this could help us understand the meaning behind the statements with a focus on the experience of the robot. We wanted to investigate to what degree Freke is interpreted as a tool or an otherness, and how the experience can be described.

We have been conscious of the aspect of the three layers of translation described by Jordan (2002, referred to by Crang & Cook, 2007, pp. 17–33) during the analysis of case 2. The participants would have to interpret each other during the discussion that took place during the workshop, then we had to interpret their interpretation of each other. Similar to what we did in case 1, we have tried to exemplify how we would describe a tool compared to a living thing and used this in our categorisation.

6.5 HOW WE USED AMORE TO DESCRIBE EXPERIENCE IN CASE 2

In the following section are descriptions of how our informants experienced Freke. We argue that this contributes to answering RQ1. The result will now be presented and discussed.

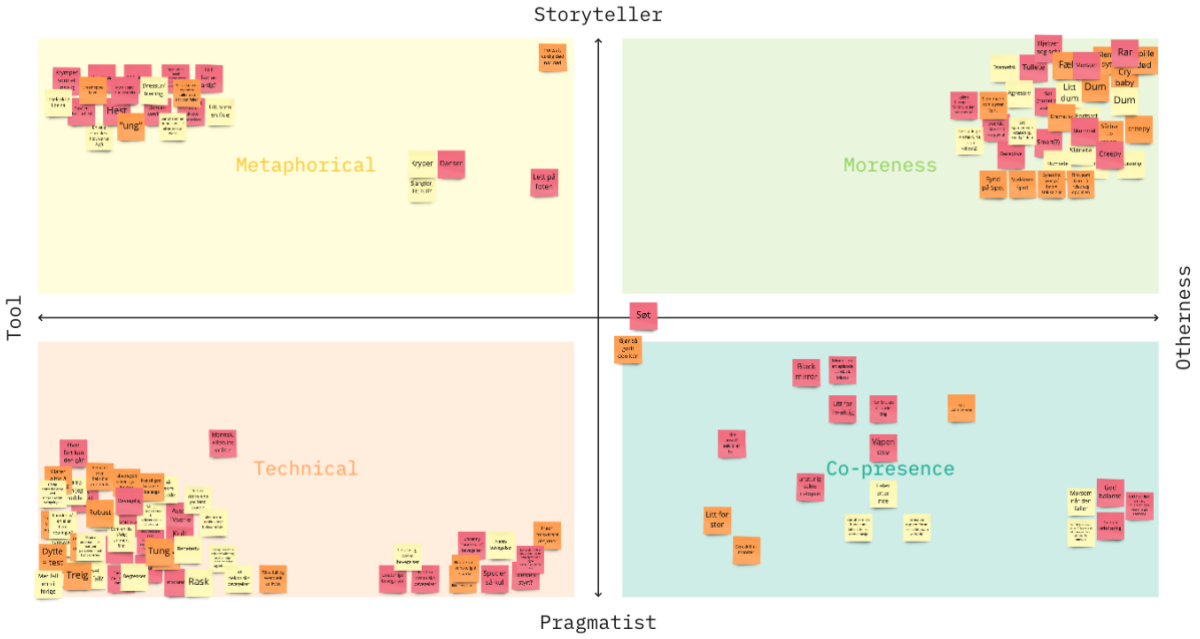

IMAGE 14: HOW AMORE WAS USED TO MAP THE EXPERIENCE IN CASE 2

6.5.1 THE PERCEPTION OF FREKE AS A TOOL

The experience of Freke seems to have a preponderance of the Technical dimension – with a seeming tool perception and a Pragmatist lens. The descriptions of Freke's movement are mostly technical and showcase some of Freke's functionality. For instance, the participants perceive Freke to be fast-moving, somewhat limited and mechanical in its movement, and robust. They also comment on the robot being controlled remotely. Words like 'reset' and 'power consumption' suggest that they see something technical and not something alive as these are words associated with technical tools. The discussion, the way they phrased themselves, and other things we observed in the workshop, together with the placement of the post-it notes, indicate that the participants mainly view Freke as a technical tool.

At the same time, within the Technical dimension, we see that there are some post-it notes placed more towards a perception of Freke as an otherness with a Pragmatist lens. One participant said that Freke does not have any defence mechanisms. This can be interpreted as a technical feature, but we interpret it as believing that Freke almost need to defend itself. Another participant said that it was easy to forget that there are humans who control the robot. In both examples, Freke is described technically but suggests that the robot is experienced as something more than a tool. It may not be that it is perceived as having animal- or human-like features, but perhaps social attributes. This would indicate a sociomorphism effect.

Even though most informants seem to describe Freke using a more technical language, some also show tendencies to the Metaphorical dimension; Freke is still perceived as a tool but described using a Storyteller style. Many of the informants felt that Freke reminded them of an animal and talked about Freke using a zoomorphic description. Most thought it resembled a dog, but also a horse, bug, lama, and grasshopper among other things. We believe that this was perhaps a way of describing what they had observed by using familiar associations. One of the film clips showed Freke walking around in circles before falling. Three participants described this by comparing it to a dog looking for a place to relieve himself. We interpret this description as a figure of speech, therefore an example of the Metaphorical dimension.

6.5.2 THE PERCEPTION OF FREKE AS AN OTHERNESS

When describing Freke as dumb, cry baby, dramatic, aggressive, clumsy, and creepy, we view this as the participants giving the robot intent and a personality. Some also described Freke as playing dead after being pushed in the third film clip. In addition, people expressed some degree of compassion when viewing this clip. We interpret this as the perception of an otherness because Freke is being talked about in a way we would normally describe living things, not a tool. Most people would not feel concerned if they saw a hammer being pushed or describe it as aggressive. On the other hand, it would be appropriate to feel concerned if you saw someone push a dog.

Some participants expressed concerns regarding the usage and future of robots like Freke. This is not the same as an experience in the present but could give us an indicator of a worry associated with autonomous robots. This was expressed during all three film clips. Some were specific and described Freke as a horror film monster 'that couldn't be killed'. The fact that Freke tripped and was pushed over, but still got up gave the association to a horror film monster. We interpreted this as being in between the Metaphorical dimension and Co-presence dimensions.

Other's descriptions were broader and more difficult to grasp the meaning of. Like Freke being 'too big' or 'too lifelike', as well as the association to the television series *Black Mirror*. Viewed in relation with the other data, this association might unveil a feeling of uneasiness that Freke gives. We interpret that this effect suggests that what is observed is more than a tool but not something alive. Such feelings may suggest an experience of an otherness as one would probably not feel the same way watching a clip of a tool.

6.5.3 MIXED EXPERIENCE

The notion of mixed experience was also evident in case 2. Just like in case 1 we would argue that our data indicates that being with Freke could be described as more than one dimension. Some of the participants focused more on the technical aspects, such as how fast it could move and how the technology can be used or misused. Others focused more on how the robot was treated and behaving.

When Freke falls over in the second film clip, it was explained by focusing on Freke's balance being affected by sharp turns. Others saw this as Freke being clumsy. We interpret this as individual differences in how they view the film clips; Some of the participants had more of a Pragmatist perspective while others were more prone to the Storyteller perspective. When talking about Freke's balance, one informant used medical terms to explain the fall. The medical terms could be seen as a technical language, which could indicate a Pragmatist perspective. We do not think one normally describes a tool as clumsy, but rather a description of living things. Hence, we interpret the usage of clumsy to describe Freke as an indicator of

the Storyteller perspective. To us, the different perceptions of Freke and the styles used to describe the robot indicate a mixed experience between informants.

During our fieldwork, we noticed that we also had mixed experience both between us and within ourselves. This was noticeable in how we perceived and talked about Freke differently from fieldwork session to fieldwork session. We can for instance point to a difference in experience in the first and third fieldwork sessions; when first meeting Freke we both perceived Freke as an otherness. It resembled something life-like and more than just a tool. Both got associations to other animals and talked about Freke using both a Pragmatist and Storyteller style. Later, at the military demonstration, this perception was not as prominent and was more tool-like.

When we compared our perceptions and descriptions of Freke, we noticed more differences that could be indications of different experiences. For instance, at FFI we asked to see Freke getting kicked to see how we would react. Our reaction to Freke being kicked was similar but differed in how we explained and perceived Freke's movement. Both felt discomfort as Freke fell hard against the ground and slowly moved one leg before shutting down. Runa's reaction was perhaps more prominent. She associated Freke's movement with the movement of someone's final breath. Runa experienced Freke dying in a non-metaphorical sense. The reaction felt spontaneous and something she could not control, even though she knew Freke could not feel the impact as it was kicked. To her, Freke was perceived as an otherness, her experience a Moreness experience. Tora, however, had a more tool-like perception. She viewed the same movement as evidence of a flat battery. Her descriptions and usage of 'dying' could be seen as a metaphorical concept for a tool running out of power.

In addition, when analysing our own experience we got more conscious of how fast an experience can change and that we could feel different things at the same time. For instance, when observing Freke 'struggling' up a pile of gravel, we could feel both concern that the expensive technology would get ruined and that it was almost gruesome to force the poor

thing to climb there. In this way, it felt like a Technical and a Moreness experience at the same time.

6.5.4 REFLECTIONS REGARDING BEING WITH FREKE

We believe it could be plausible that Freke with the modification done by FFI (Freke) could give the users a somewhat different experience than perhaps intended by Boston Dynamics. Freke appears to create a Metaphorical experience in people. At the same time, representatives from FFI are clear about the fact that the robot is equipment – 'something-in-order-to'– to reduce the risk for soldiers. We interpret that the FFI and the soldiers we talked to seemed to perceive Freke as a tool but convey the role of Freke using the Storyteller perspective. Hence, we believe that the most prominent dimension within the experience is Metaphorical.

As mentioned, some informants associated Freke with *Black Mirror.* In addition, they expressed scepticism regarding how Freke and similar technology could be misused in relation with weapons. We have also been told about a woman that was concerned about war when seeing FFI doing experiments with Freke. Civilians might not be familiar with FFI's intentions of what Freke is meant to be, and the experience may cause unnecessary distress.

Another factor that might affect how Freke is perceived is to what degree it is perceived as autonomous. A passer-by expressed distress watching Freke 'walking' until she noticed the person controlling the robot. She said she felt concerned when she believed it was 'walking' by itself. If it is perceived as more autonomous than it is, it may affect how being with the robot is perceived and the association the robot may promote.

IMAGE 15: FREKE HAS NOW CHANGED COLOUR. COULD THIS AFFECT THE EXPERIENCE OF BEING WITH THE ROBOT? PHOTO FFI.

The last factor we want to highlight is Freke's form. The robot's doglike features may influence the experience as humans associate it with a dog. They might therefore perceive the robot as an otherness. As already mentioned, our informants associated Freke with different animals and described it using both a Storyteller and Pragmatist style. In addition, we believe the change in Freke's colour also might affect how the robot is perceived. During most of our research, Freke has been sporting its 'standard' yellow colour. Now Freke is military green. This change might create a stronger affiliation to the Norwegian armed forces and through this also influence the experience of being with Freke. This assumption is supported by a recent event with Freke. At this event, Freke was military green. Some were seemingly more unsure than what we noticed during our fieldwork. People have been curious and a little sceptical, but during this event, people made detours to avoid Freke.

Freke is meant to be equipment, a tool in a hybrid team consisting of other autonomous systems such as drones and unmanned ground vehicles (UGVs), and humans. FFI imagines that robots such as Freke could be used to replace soldiers in potentially dangerous situations, and therefore there may not be many humans around to experience the robot. According to our findings, Freke could be perceived as an otherness. This perception can be problematic in the intended use as it may be challenging to sacrifice a robot that is perceived as something other than a tool. Hence, it is important to consider how robots are presented and experienced. Especially in a use context where the desirable perception is more on the tool side of the continuum.

6.6 COMPARING THE DESCRIPTIONS

Our main finding is the framework Analytical Mapping of Robot Experience (AMoRE). Using AMoRE we have described the experience of being with domestic robots in case 1, and Freke in case 2. Comparing the experiences of both cases, we see a lot of the same tendencies. In both cases, we see examples of mixed experience. The Technical dimension seems to be most prominent where the robots seem to be perceived as tools. There also seem to be elements that suggest the dimensions of Moreness and Co-presence, where the robots are perceived as something towards an otherness. Furthermore, the robots appear to awaken associations to animals, especially Freke. The fact that the experience can be described similarly in two cases is an interesting finding in itself.

Case 1	Case 2
Mostly Technical dimension	Mostly Technical dimension
Mixed experience	Mixed experience
Less tendency to zoo-, anthropo-, and sociomorphism	Tendency to zoo-, anthropo-, and sociomorphism
Seems to be a change in experience/perception over time	Worry for the future

TABLE 2: DESCRIPTION OF THE EXPERIENCE IN THE CASES COMPARED

6.7.1 MOST PROMINENT WITHIN THE TECHNICAL DIMENSION

The distribution of post-it notes are similar in both cases, thus even though the experience appears to be mostly Technical, we see elements of the other categories in both cases. We have defined a Technical dimension as perceiving the robot as a tool and talking about the experience in a Pragmatist fashion. Our findings suggest that the robot is perceived as more than just a tool and ‘something-in-order-to’. However, we do not know the reason for this

result. We cannot say with certainty whether the result of more post-it notes in the Technical dimension is in fact because the *experience is more technical* or because it is more *talked about.*

We have already mentioned the usage of metaphors as a way to explain phenomena, but we question if our informants tend to use a language similar to a pragmatic language. It could be that the informants have simply expressed what they saw, without it reflecting how they experienced what they saw. This could easily tend to be more pragmatic as it would perhaps be a factual report and not an expression of experience. If this is the case we may have misinterpreted the amount of Technical experience people have, or if there is Technical experience at all. We have not investigated why people experience what they experience. More research is required to explain why.

6.7.2 MIXED EXPERIENCE

There seems to be mixed experience between each informant as well as within each informant. This applies in both cases. As mentioned, we understand experience as "the content of a person's subjective knowledge and history, of external sensory influence (perception), emotional state (feelings), thought processes, motivation and more" ('opplevelse', 2020, translated from Norwegian by Tora and Runa). Because of our definition of experience, this was not a surprising finding. For instance, one participant both felt the robot vacuum cleaner had a personality and that it was a tool.

We believe one of the reasons for mixed experience between informants is because the experience is influenced by individual factors. According to the definition that we have used, experience consists of our subjective knowledge, emotional state, thought process, and motivation. A person's being can therefore create the foundation for the experience. For instance, our findings indicate that the owner of robot vacuum cleaners can experience their robots very differently. This is perhaps not so strange when we understand how complex one person's experience can be.

The difference in how Tora and Runa describe the same encounter with Freke could also be explained by individual differences in for instance subjective knowledge and history. Runa associated Freke with her dog and felt like it was a good thing. Tora does not own a dog and felt uneasy. She could not see who controlled Freke, felt unsure of Freke's intentions, and associated it with a dog without a leash. Both agree that they had a Moreness experience, but this does not reflect the nuances of that experience. We believe that probably no person's experience is exactly the same. Still we argue that the experience can be systematised and described, and therefore is comparable.

In addition, we also felt the experience change rapidly, making the overall experience more complex. We find the complexity of the experience interesting, and wonder if this also could be related to the individual factors. Sometimes the shift could happen so quickly that it almost felt conflicting. For instance, we both felt a fascination with the technology and something similar to sympathy towards Freke when the robot 'struggled' walking through tall grass. To us, the presence of both the Technical and Moreness dimension created a conflicting experience where Freke was perceived both as a tool and otherness.

CHAPTER 7: DISCUSSION

This chapter consists of four parts. 7.1 and 7.2 are discussions of how our main finding, AMoRE, can be used to answer our research questions. We will begin by discussing research question 2, *How can the experience of being with a moving non-social robot be systematised?* Here we will compare AMoRE against other theories and concepts and discuss how AMoRE can be used to analyse the experience. We assume that systemising experience can make it easier to describe the experience, and by doing this answer research question 1 *Is there a way to describe the experience of being with a moving non-social robot*. Chapter 7.2 consists of a discussion of this research question, where we argue that the usage of AMoRE can create a basis for describing the aspects of the experience. 7.3 extends on these discussions and presents how AMoRE can be used to describe, regulate and evaluate robot use from a societal perspective. We end this chapter in 7.4 with a discussion of further research.

7.1 HOW AMORE CAN BE USED FOR SYSTEMATISATION OF EXPERIENCE

In the field of HRI, there are already theories and concepts about how humans perceive and treat robots that can be used to systematise the experience of being with robots. Nass & Reeves (1996) emphasise the human tendencies to treat computers as social actors. They called this theory the *media equation*; the human likelihood to treat computers and other media as if they were social actors, as well as assign human characteristics to them. We interpret that both Turkle and Darling agree with this theory but address how humans perceive and treat technology differently. Turkle (as cited in Coeckelbergh, 2011b, p.199), argues that computers are experienced as something not quite animate and alive, but still are not inanimate. According to her, this is apparent in the way humans treat computers. Darling (2017) takes this further to include robots and argues that humans treat them even more like something living and animate.

We agree with both Darling (2017) and Turkle (as referred in Coeckelbergh, 2011b, p.199) in that robots can be treated as something almost in-between inanimate and animate. We found similar tendencies in how people perceive the notion of being with a non-social robot. For instance, one participant apologised to his robot but described it as inanimate. One way to systematise the experience could therefore be thought of as the notion of animacy.

However, we find this systemisation imprecise. How people act towards the robot could imply the perception of the robot as a social actor – an otherness. It does not indicate that the experience of being with the robot is the same as being with a social actor like a family member or a pet. We argue that perception is only a part of the experience. The media equation can indicate how people perceive the robot, but do not describe the complexity of the experience. The perception of the robot as something in between, and the effect this might have on the experience as a whole, is something that can be illustrated with AMoRE.

We imagine that a potential explanation for the media equation theory is anthropomorphism. Hence, anthropo-, zoo-, and sociomorphism can perhaps be used to systematise the experience. Anthropomorphism is when humans interpret objects as having human-like capabilities such as motivation and intentions they may not have (Epley et al., 2007). According to Duffy & Zawieska, (2012), this effect can cause humans to treat artefacts as if they were alive, even with the knowledge that they are not, which could be seen as the media equation. We believe that zoomorphism also could lead to something similar, depending on whether or not an animal can be viewed as a social actor. It could be argued what the humans describe using anthropomorphic and zoomorphic terms, are their perception of sociality. This is in line with the concept of sociomorphism as defined by Seibt et al. (2021).

Our informants conveyed how they perceived being with a robot by using i.a. zoomorphic and anthropomorphic terms. It is our opinion that the usage of such terms could be an expression of the actual perception of the robot as something animal- or human-like. Still, the usage of zoomorphic and anthropomorphic terms could be interpreted as the use of metaphors or linguistic pictures. This is in line with what Larkoff & Johnson (1980) states, that humans

often use metaphors when expressing themselves and that they are based on concepts that are familiar to humans. It could therefore be challenging to distinguish the complexity of the actual experience by only looking at the speech.

We argue that it is necessary to use an analytical framework that can distinguish between the figure of speech and perception. AMoRE does this. For instance, it is possible to distinguish between the Metaphorical and Moreness dimensions, where the perception of the robot is different while the description style in both dimensions is Storyteller. Therefore, we would argue that analysing with AMoRE can be used as an answer to the research question: *How can the experience of being with a moving non-social robot be systematised?*.

7.2 HOW AMORE CAN BE USED FOR DESCRIPTION OF EXPERIENCE

Using the dimensions in the analysis provides a starting point for describing the nuances within the experience. AMoRE is thought to be an analytical tool to interpret qualitative data, similar to how an affinity diagram would be used. An affinity diagram is a great method to structure and understand a big amount of different kinds of data by sorting information into clusters. This makes it possible to understand the relation between the bundles and name them accordingly (Dam & Siang, n.d.). Similar to an affinity diagram, the analysis creates clusters. It is the placement of the clusters that assist the analyst with interpreting the data and making sense of the experience of being with a robot.

AMoRE is not a map over the whole experience, but an analytical tool that can indicate dimensions within the experience. The dimensions can be used as a starting point to describe aspects of the total experience. We argue that the amount and the placement of data, in combination with descriptions of the content can be used as an indicator to describe the experience; Data within the Technical dimension would indicate a Technical experience, while data within the Moreness dimension would indicate a Moreness experience. However, that an experience seems to be e.g. Technical indicates to us that there is a preponderance of

this dimension. Not that the experience is only Technical or that this is the only dimension relevant to describe the experience. We argue the experience is compound, and that all four dimensions can be present to some degree.

As the analysis is qualitative it is necessary to be careful when looking at the frequency of the different datasets. To some extent, the map will indicate the experience, but one should not only focus on the amount. For instance, a preponderance of data in the Technical dimension can indicate that technical aspects were talked about a lot. When describing the experience it may not be representable to only describe the Technical aspect. Therefore, one should not just look at the distribution of the data, but also what that data within the dimensions consists of. It could be more fruitful to examine how the perception of the robot is. It is important to not rely too much on the mapping but to use it as a starting point to describe the experience in combination with the rest of the analysis.

To describe the experience it could be useful to emphasise *how* it is being said, in addition to what is being said – if the experience is expressed with Storyteller or a Pragmatist style. One way of doing this is by looking at the degree of linguistic imagery and soberness. For example, within the Metaphorical dimension, one could say that "It did not want to return *home* that *bastard*"[15]. Within the Technical dimension, one could instead say "The *robot* did not manage to follow the wire back to the *charging station*". Both indicate – when viewed together with the context it was said – a Tool-like perception. However, how this is expressed varies depending on the usage of metaphors (home and bastard) and technical language (robot and charging station). We argue that the difference in dimension could be used to indicate the difference in experience.

We find that there can be variations in experience both between dimensions, but also within a dimension. For instance, as mentioned in chapter 6.5.3 Tora and Runa experienced watching Freke walking toward them very differently, even though both experiences could be

[15]See appendix IV for an overview over translated quotes.

described as within the Moreness dimension. Therefore, when describing the experience it is not sufficient to only describe the dimensions but the content as well. It is the result of the data being sorted into dimensions, together with a description of the content, that can be used to describe the experience of being with a robot.

It can be challenging to only base the analysis and through it the description of experience, on what is explicitly expressed by informants. Coeckelbergh (2011a) states that having a language that only distinguishes between object or subject, and perhaps not something in between, can affect how a robot is interpreted and explained; There may be a lack of words to describe precisely what the experience is. Further, it is possible to distinguish between implicit perception and how that perception is explicitly explained. Cappuccio et al. (2021) argue that there could be a contradiction between explicit and implicit attributions. According to them, it is possible to react (implicit anthropomorphism) incongruently with how the experience is explained (explicit anthropomorphism). Therefore, it can be challenging to interpret what is explicitly said and further describe the experience. Because our analytical framework allows the analyst to look at the data holistically, we argue that AMoRE can make it easier to describe.

Our main research question is *Is there a way to describe the experience of being with a moving non-social robot?*. We argue that it is possible to describe the experience of being with a moving non-social robot and that AMoRE contributes to this. With AMoRE it is possible to systematise aspects of the experience and use the dimensions and axes as a foundation when describing the experience. This way one can more easily describe the complexity of the experience, based on a systematic and theory-based approach.

7.3 AMORE IN COMBINATION WITH OASIS

AMoRE can be used to systematise and describe an experience from a subjective perspective, but it can perhaps not be used to explain the reason for the experience. It can, however, be interesting to combine this analysis with an analysis of what a robot objectively simulates in order to understand the reasons for the experience. In this discussion, we want to discuss the usage of AMoRE in combination with OASIS, as we assume the combination would provide an extensive understanding and description of the experience of being with robots.

7.3.1 HOW AMORE AND OASIS COMPLEMENT EACH OTHER

(Seibt, 2018) developed the framework OASIS to be a descriptive language that can help achieve a better understanding of experienced sociality in human-robot interaction. According to her, a robot can only simulate social capabilities and will not have actual intentionality and understanding of what is happening in the interaction – at least not today. The various levels of simulation can be used to better understand what is going on in the interaction[16].

OASIS could be used to develop a classificatory system for how humans experience robots (Seibt et al., 2021). They believe it is possible to differentiate between how sociality is experienced. TES – types of experienced sociality – is a concept used to distinguish between different types of being with something or someone. TES focuses on how the experienced sociality is with something similar or different from the first person. Seibt et al. (2021) that the sociality a human can experience when being with a cat is different than when being with a human being. We believe humans can feel an absence of sociality when being with some*thing*, such as a hammer.

[16] More details on the levels of simulations in chapter 2.3.1

AMoRE can be seen as an analytical framework extending on the concept of TES as the focus on experience is slightly different. The experienced sociality could be seen as a part of the whole experience, or something that affects the experience to be more Moreness or Co-presence. Thus, we believe that OASIS lacks a deeper focus on the subjective experience, and not necessarily just the experience of sociality.

AMoRE can perhaps be used to find out to what degree sociality is experienced by looking at the dimensions within a human's experience. With a high degree of sociality, the human might experience an otherness. Our usage of otherness in AMoRE entails the experience of something in-between object and subject. We believe that the experience of a higher degree of sociality[17], which might imply the perception of a robot as an otherness. Low or no degree of sociality on the other hand might indicate the experience of the robot as a tool. Therefore, one may talk about degrees of sociality, even though it might be challenging to quantify.

The focus of OASIS is more about describing what is going on in an interaction between a human and a robot, from an objective perspective. AMoRE focuses more on *what* and *how* the experience is in a broader sense. Combined, we believe a more detailed understanding and description of being with a robot could be provided, in addition to a more objective description of the robot's 'actions'. This can perhaps give a fuller picture of what the robot is intended to do and how well the intended experience is achieved.

Seibt et al. (2021) argue that a generic classificatory framework like OASIS will be a first step to solving the '*the triple gridlock*' – describing, evaluating, and regulating the use of robots. If humans can not describe precisely what happens when using robots it will affect the evaluation of usage and the regulation of it. This is related to the problem that the long-term effects of integrating robots in society may only become visible when it is too late to change and remove the technology. A part of this is the *description problem*, which involves a lack of precise and standardised terminology to describe the interaction between robots and

[17] We are reluctant to use high and low to describe how TES could be experienced. Instead, sociality may be experienced differently depending on what is perceived – a tool or an otherness.

humans. In many cases, metaphors and words that suggest robots have intention are used, which according to (Seibt, 2018) creates a false idea of what is happening.

A better description of experience with robots can not only be useful when designing and evaluating specific robots. It can also be part of a solution of improving better research, regulation, and evaluation of the use of robots from a societal perspective. We argue that the knowledge of how to describe the experience of being with robots could be relevant when considering the potential long-term effects.

7.3.2 HOW AMORE AND OASIS COULD CONTRIBUTE TO SOLVING TRIPLE GRIDLOCK

Because of how the frameworks complement each other, we would argue that a combination of both frameworks would be a step closer to solving the description problem. Furthermore, the combination of OASIS and AMoRE can perhaps also contribute to solving the evaluation and regulation problem. For instance, they can be used to investigate whether an interaction between humans and a specific robot has the desired effect. If we can evaluate the effect of the robot better it may be easier to decide how to regulate the use of robots. Then we could perhaps be a step closer to solving the regulation problem. As Seibt et al. (2021, p. 53) put it:

> Once we have sufficiently differentiated conceptual tools in terms of which we can precisely describe what humans experience in interactions with 'social' robots, we can evaluate the impact of social robotics applications on human well-being, and regulate the use of this technology accordingly.

We argue that combining AMoRE and OASIS could provide an extensive description of both what is objectively going on in human-robot interaction and a description of the experience. This can further be used as a step to solve the triple gridlock. However, it requires more research and practical investigation. AMoRE can contribute towards a solution to the triple gridlock by gaining more insight in a general experience, not just experienced sociality. This will provide a better description of the experience.

7.4 FURTHER RESEARCH

There are many ways to systematise experience and describe the experience. Our presentation of further research will deal with aspects that could have affected how AMoRE answers RQ 1. During the creation of AMoRE, we chose to use the lenses ‘tool’ and ‘otherness’ to systematise what the perception of domestic robots and Freke is. We think that this choice has affected the description of the experience and assume that the description would be different with other perspectives. We want to present our thoughts regarding engagement in usage, use and use context, and thoughts on how AMoRE could be relevant in evaluation.

A big part of our understanding of ‘tool’ is based on Heidegger’s definition, we have been affected by his conceptual understanding where the robots could be described as ‘something-in-order-to’. However, we have not focused on the ‘use’ aspect when it comes to experience. We argue that how one might be engaged in the usage of a robot will influence the experience of being with a robot. According to Heidegger, there are two ways to engage in the usage of equipment: ‘ready-to-hand’ and ‘present-to-hand’. When ‘ready-to-hand’, the equipment will be experienced as an extension of the user and ‘out of sight’. ‘Present-at-hand’ will be experienced differently. The tool is paid attention to and becomes more present in the usage.

We find that the concept of ‘ready-to-hand’ must be expanded to include the usage of robots as robots such as Domestic robots and Freke are not extensions of the user’s body and force. We argue that it could be possible to view the robot as an extension of the user in the sense that the user ‘does’ more than one operation. The robot is an extension of the user when the technology executes the operations instead of the user itself. In this sense, the user extends the possibility of what it can do in a given time. For instance, the user could get clean floors as well as get the dinner ready. To simplify, one could say the same with a hammer: The hammer extends the possibilities of what the human can do by focusing the user's force. We, therefore, want to broaden Heidegger’s concept of ‘ready-to-hand’ in that equipment can be an extension in the sense of one person's capabilities.

To the best of our knowledge, the perspective on 'ready-to-hand' and the use of the broadened concept in relation to experience has not been investigated yet. We believe that the usage of 'ready-to-hand' and 'present-at-hand' would provide an extensive description of the experience. It can enable researchers to describe how experience and engagement in usage affect each other. Further, we believe that this could be used to understand how experience can lead to potential consequences when it comes to usage.

In addition to the engagement in usage, we argue that a focus on how the robot is used and what it is used for could provide insight into how the use context and intended role of the robot influence the experience. In a use context, AMoRE could be instrumental to investigate where changes have to be made so that the users' experience of the robot is consistent with what the robot creators wanted. For example, social robots are often designed to facilitate sociality (Darling, 2017). AMoRE could be used to investigate how experience with such robots can be described. We hypothesise that social robots would be perceived more towards otherness and perhaps talked about more from the perspective of a Storyteller. These are only speculations and would be interesting to investigate further.

Furthermore, we do not know what potential benefits or consequences of having the various types of experiences. For instance, having a preponderance of the Moreness dimension could be beneficial in a therapeutic context. According to Darling (2017), the greatest advantages of using a social robot can be achieved when there is established a relationship between the human and the robot. To achieve a relationship with the robot we believe the robot needs to be experienced as an otherness. In addition, there are also contexts where it is not desirable for the robot to be perceived as an otherness. As we mentioned in the introduction, a colonel stopped using a robot after he perceived it as inhumane to see the robot be damaged by mines. When certain types of experiences are preferable and how they affect usage would be interesting to research further.

CHAPTER 8: CRITICAL REFLECTION

In this chapter, we present three main critical elements of our project. First, case study as methodology is reflected upon, with a focus on how our multiple case study was executed compared to how we had planned it. Next, the execution of our methods with a special focus on what they have meant for analysing our findings is discussed. Lastly, we reflect upon how we have used our subjective interpretations both to analyse and as part of our results, and challenges regarding this. These reflections may help with critically evaluating our findings.

8.1 OUR METHODS

We used different data collection methods in both cases. This could have made the cases difficult, if not impossible, to compare as the data foundation could be seen as too different. In case 1, we primarily used diary and follow-up interviews as our data collection. In case 2, we used a workshop. These two data collection methods have different strengths and weaknesses, which could have made the data too different to compare. The fact that we used field studies to triangulate could be seen as an attempt to accommodate the difficulty of comparing the cases.

When comparing diary and follow-up interviews with workshops, we argue that it is important to mention the different approaches to interviews and how this might affect the data. During our research, we used semi-structured interviews. It is our opinion that this demands more of the informant when it comes to the ability to express what the informants *really* mean. With a workshop, however, the demand is somewhat different as the task typically done in the workshop might be creative and based on group discussion. We would therefore argue that the demand of the user is based on the ability to be creative and to discuss in groups.

In addition, interviews were performed one to one while the workshop was done in groups. This could also have affected the informants' ability to express themselves as it is a very different social situation. We imagine that the situations can be experienced differently. In an interview, one is guided by the interviewer and only has to relate to that. In a workshop, on the other hand, informants perhaps meet new people and have to talk out loud and discuss with strangers. The mix of people might affect what and how the discussion takes its course. Some might bloom in a workshop, as the mix of people affects the thought process positively. Others might bloom more in interviews, where specified questions might guide the thought process. The individual differences among the informants as well as the structural differences within the data collection methods might make the comparison of the two cases difficult.

Our informants in the workshops never experienced being with Freke. They only saw short film clips and never observed Freke in its use context. There was not a big difference between what was experienced during the fieldwork and what was discussed in the workshop. In both situations, we captured spontaneous reactions as well as listening in on conversations that expressed what they were thinking and feeling; they expressed how e.g., Freke affected them. We do understand that viewing clips and meeting a robot in real life is not the same. Based on our understanding of experience, the notion of perception is part of what makes an experience. Therefore, we believe the film clips indicate what the participants could experience given the opportunity to actually be with Freke

8.2 CHALLENGES WITH SUBJECTIVE INTERPRETATION

The fieldwork we conducted has helped us interpret data during our analysis, as well as shaped our impression of how the experience could be regarding our own experiences. Our approach to fieldwork is similar to autoethnography, where the researchers could be both researchers and informants (Adams et al., 2017). We used our own experience as a basis for interpreting our informants' descriptions since we believe the notion of experience is difficult to explain. This approach was mostly used in case 2. However, using our own experiences

this way could probably affect our interpretation steer our interpretation of the data towards something that made sense to us, and potentially prevent us from understanding what they experienced. We have been aware of how our interpretations have affected our research and therefore also affected its replicability and validity.

We have followed an interpretive paradigm and believe the notion of experience is subjective. To understand what our participants do experience, a goal during our research has been to reach intersubjectivity. However, we are unsure if this has been achieved. We find ourselves wondering if we have managed to understand what our informants tried to express. Simultaneously, we wonder if the informants managed to express their subjective reality of what they experienced. Even with triangulation, we believe miscommunication and misunderstandings are prone to happen. Therefore, we find it hard to say to what degree intersubjectivity is achieved.

Still, we would argue that there are common features in our data. This could indicate that we – to some degree – have achieved intersubjectivity and that we have investigated experience. However, we have been the ones that have analysed the data. Our interpretations have been influenced by the literature we have read, as well as our own experiences. During analysis, we could be 'exposed' to confirmation bias, as we might have been subconsciously looking for aspects that would indicate accordance with literature and our own experiences.

We do not believe we can be objective in our formal and informal analysis. As mentioned in chapter 4, informal analysis happens almost all the time and could happen during conversations. This can affect the traceability of our study. During conversations, our subconsciousness could influence our interpretations and affect the result of the informal analysis. Basing analysis more on textual data instead of our interpretations and memory would lead to better traceability. Therefore, it is challenging for us and other researchers to potentially confirm our findings and check the results.

At the same time, we had follow-up interviews where we argued that the participants got the opportunity to further explain and prevent misunderstandings. During data collection, we have also tried to ask whether we have understood the informants correctly. Therefore, we would argue that we have taken measures to prevent misguided or misunderstood interpretations of the informants' descriptions.

8.3 LIMITATIONS WITH AMORE

What AMoRE maps depends on the data collected. Therefore, the result of using AMoRE is only as good as the data that is used to analyse. It is only intended to be used in combination with other analytical methods in order to sort the data in a way that makes sense to the analyst. It is the result of the data being sorted into dimensions, together with a description of the content, that can be used to describe the experience of being with a robot.

In addition, AMoRE requires data that – in some way or another – reflects how a robot is perceived and talked about. Without this focus the data might not fit into any dimensions. Because of this limitation one may risk excluding information that is still interesting, even if it does not fit into the mapping. Therefore, it is important to not rely too much on the mapping but use it as a starting point to describe the experience in combination with the rest of the analysis.

Further, the data used needs to have already been through some iterations of analysis. The amount of preparation may make analysing with AMoRE time consuming. It could take time to first get familiar with AMoRE as a framework, and then use AMoRE to map out the experience in several iterations. In that sense, the mapping could be redundant if the prior analysis is done thoroughly. Still, we argue that it may be worthwhile to spend time on the analysis because this can result in a more thorough description of the experience.

CHAPTER 9: CONCLUSION

This thesis investigated the research questions *Is there a way to describe the experience of being with a moving non-social robot?* and *How can the experience of being with a moving non-social robot be systematised?*. We performed a multiple case study to investigate how humans experience being robots with two cases. Case 1 consisted of domestic robots, namely robot vacuum cleaners, and robot lawnmowers, while case 2 encompassed the robot Freke, belonging to FFI. Through our data collection and analysis, we found that we could examine the combination of how a robot is perceived and the way the experience is talked about to as a means to systematise the experience. This formed the foundation for our main finding, the analytical framework AMoRE. We believe AMoRE can be used when analysing qualitative data regarding the experience of being with a robot, and thus systematise and describe the experience.

Using AMoRE led to a description of the experience of being with a robot as mixed and not just Technical. We argue that robots can be perceived as both tools and an otherness and be described using both a Pragmatist and Storyteller style. There are individual differences but using concepts from AMoRE can make the experiences comparable.

For further research, it would be interesting to include the perspective of usage and engagement in usage when describing experience. It would also be interesting to have a better understanding of when certain types of experience are preferable.

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APPENDIX

APPENDIX I: QUESTIONS FOR THE DIARY STUDY

1. **Bevegelse**
   - Beskriv kort hvordan roboten beveget seg i dag
   - Hvordan tolket jeg det (frivillig)?
2. **Kommunikasjon**
   - Har du snakket til eller med roboten (kan være banneord)? Hvis ja, hva sa du eller hva snakker dere om.
3. **Opplevelse**
   - På en skala fra 1 til 10 (hvor 1 er veldig misfornøyd og 10 er superfornøyd), hvor fornøyd er du med roboten i dag?
   - Begrunnelse eller kommentarer (frivillig)
4. **Utfordringer**
   - Satte roboten seg fast? Hvis ja, hvordan opplevde du dette?
   - Er det noe du har lyst til å fortelle som ikke er spurt om?

APPENDIX II: GUIDES FOR INTERVIEWS

FOLLOW-UP INTERVIEWS

This guide was used as starting point and modified according to the content of the individual diary.

1. **Introduksjon:**
    - Fortelle om hvem vi er og hvorfor vi ønsker å intervjue informanten.
    - Vi går gjennom samtykkeskjema og forteller om rettigheten til å få innsyn i innsamlet data som angår informanten og retten til å trekke tilbake samtykke, samt hvordan dette kan gjøres.

2. **Oppvarming:**
    - Hvor gammel er du?
    - Hva jobber du med?
    - Kan du fortelle litt om bosituasjonen din (leilighet, enebolig, antall mennesker/dyr i husholdning)?
    - Hva slags type robot har du?
    - Hvor lenge har du hatt den?

3. **Hoveddel:**
    - Hvordan vil du beskrive roboten?
    - Hvordan tenker du at roboten får til det du ønsker?
    - Hvor nyttig opplever du å ha roboten?
    - Hvor mye kontroll opplever du å ha?
        - (I hvilken grad oppleves den som autonom/selvstendig?)
        - Hvordan styrer du den? Hvordan oppleves dette?
    - Hvordan har rengjøring blitt etter innføring av roboten?
    - Husker du førsteinntrykket du hadde da du først fikk roboten?
        - Hvordan opplevde du det?
        - Fulgte du med på den?
    - Har du endret oppfattelse av den?

4. **Avrunding:**
    - Hva er det beste med å ha robotstøvsuger?
    - Hva er det verste med å ha robotstøvsuger?

5. **Avslutning:**
    - Spørre om det er noe informanten vil tilføye
    - Takke for at informant tok seg tiden til å være med

IN-DEPTH INTERVIEWS REGARDING ROBOTIC LAWNMOWERS

This guide was used as starting point and modified for each interview.

1. **Introduksjon:**
   - Fortelle om hvem vi er og hvorfor vi ønsker å intervjue informanten.
   - Nevne problemstilling og interesseområde
   - Hvordan oppleves roboter i ulike kontekster. Ser på to ulike roboter - hjemme og i militæret. Vi går gjennom samtykkeskjema og forteller om rettigheten til å få innsyn i innsamlet data som angår informanten og retten til å trekke tilbake samtykke, samt hvordan dette kan gjøres.

2. **Oppvarming:**
   - Hva slags type robotgressklipper har du?
   - Hvor lenge har du hatt den?

3. **Hoveddel:**
   - Hvordan vil du beskrive roboten?
     - Har den navn? Hvordan valgte du navn?
     - Formen? For en som er blind f.eks.?
     - Hvordan beveger den seg i hagen?
   - Utfordringer og tilpasninger tilknyttet bruk av roboten
     - Må du ofte flytte på ting i hagen for å gi roboten bedre tilgang?
     - Setter den seg fast i ting?
     - Hvordan oppleves dette? Hva kjenner du på da?
     - Hvordan finner du ut av om roboten har satt seg fast?
     - Opplever du det som greit å ikke følge med på roboten når den klipper gresset?
     - "Stoler du på" at den gjør det den skal?
       - Hvorfor? Hvorfor ikke?
   - Hvordan har hagearbeid blitt etter innføring av roboten?
   - Husker du førsteinntrykket du hadde da du først fikk roboten?
     - Hvordan opplevde du det?
     - Fulgte du med på den?
     - Grav i opplevelsen, hvordan beskrives dette?
   - Har du endret oppfattelse av den?

4. **Avrunding:**
   - Hva er det beste med å ha robotgressklipper?
   - Hva er det verste med å ha robotgressklipper?

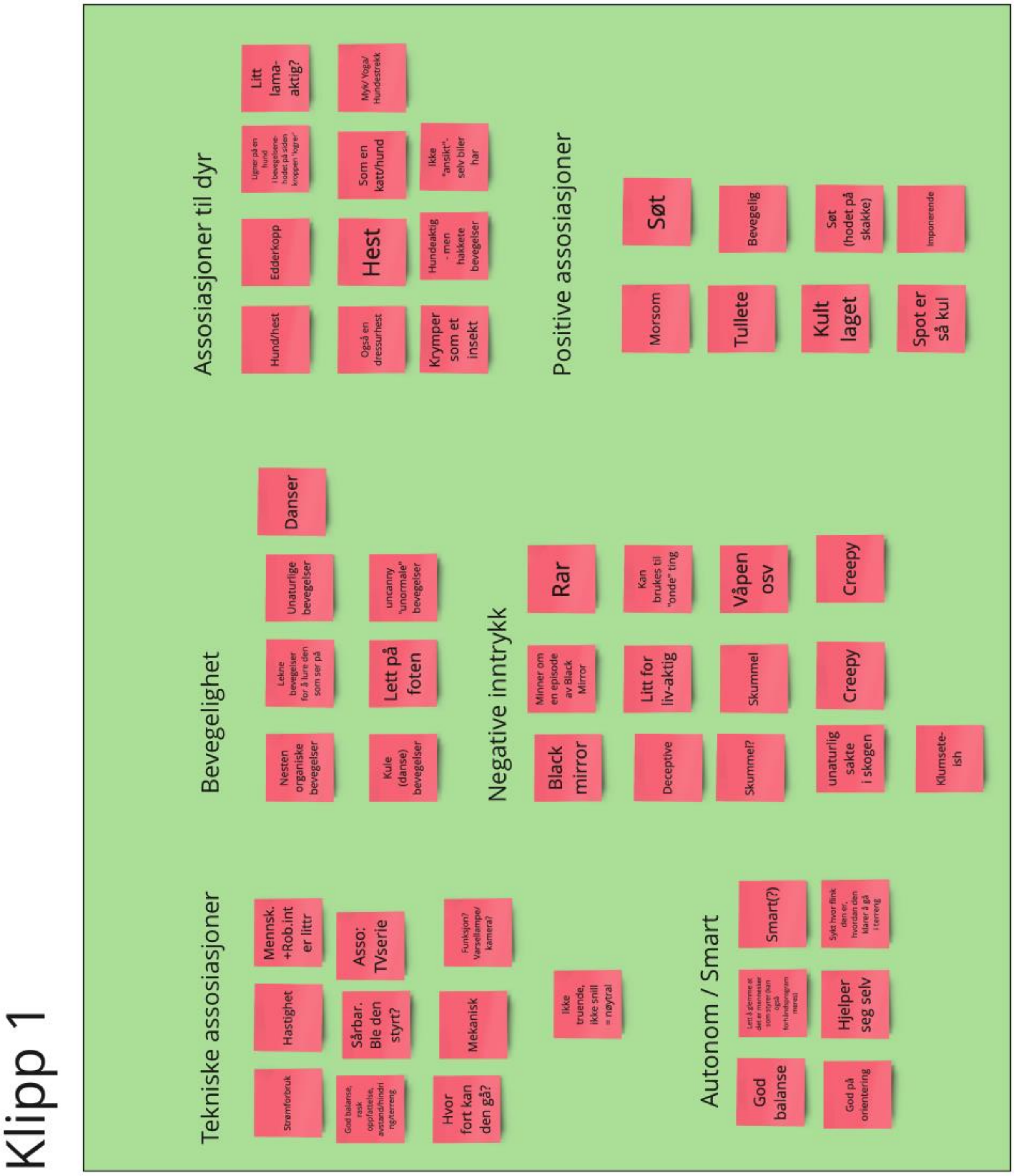
5. **Avslutning:**
   - Spørre om det er noe informanten vil tilføye
   - Takke for at informant tok seg tiden til å være med

APPENDIX III: LIST OF THEMES IDENTIFIED IN OUR ANALYSIS

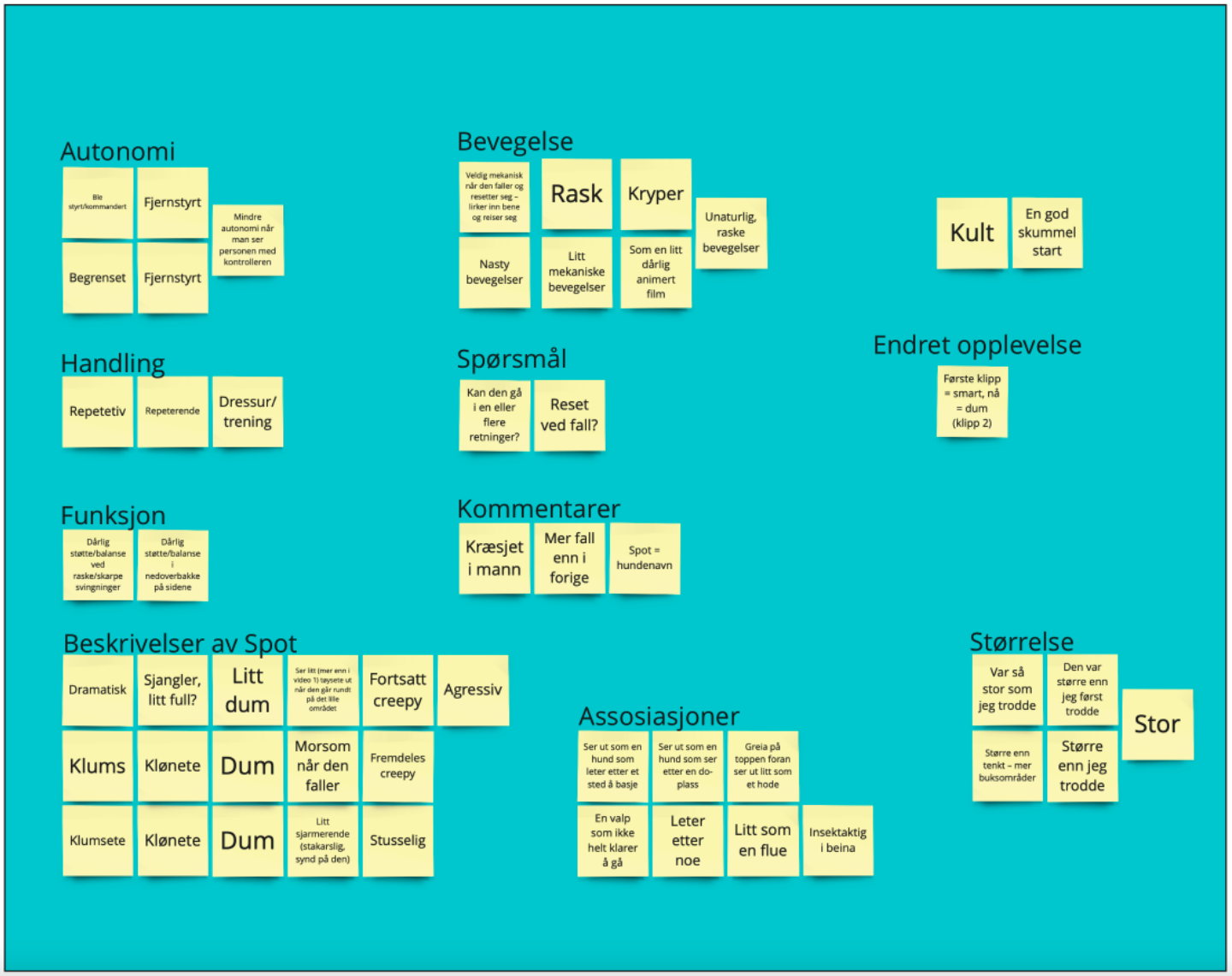
CASE 1

Overordnede temaer	Underordnede temaer
Førsteinntrykk og bekjentskap	· 'Ingeniør' · 'Historieforteller' · Etter en stund med bruk · Eierperiode
Navn og personlige pronomen	
Tilpasning	· Rydde før og under bruk · Sette opp kjørerute · Grupe inn i arbeid · Om leiligheten/hjemmet
Automatikk	· Nå · I en ideell verden
Positive opplevelser	
Negative opplevelser	
Mens roboten 'jobber'	· Følger ikke med · Jobber i team · Følger med
Kommunikasjon med roboten	· Styring · Verbal enveiskommunikasjon · Feedback til bruker

Beskrivelser	· Rolle · Forklaring · Opplevelse · Form
Bevegelser	· Ved motstand · Ved vask


Klipp 1
Tekniske assosiasjoner
Strømforbruk
Hastighet
Mennsk. +Rob.int er littr
God balanse, rask oppfattelse, avstand/hindring/terreng
Sårbar. Ble den styrt?
Asso: TVserie
Hvor fort kan den gå?
Mekanisk
Funksjon? Varsellampe/ kamera?
Ikke truende, ikke snill = nøytral
Autonom / Smart
God balanse
Hjelper seg selv
Smart(?)
God på orientering
Sykt hvor flink den er, hvordan den klarer å gå i terreng
Bevegelighet
Nesten organiske bevegelser
Lekne bevegelser for å lure den som ser på
Unaturlige bevegelser
Danser
Kule (danse) bevegelser
Lett på foten
uncanny "unormale" bevegelser
Negative inntrykk
Black mirror
Minner om en episode av Black Mirror
Rar
Deceptive
Litt for liv-aktig
Kan brukes til "onde" ting
Skummel?
Skummel
Våpen osv
unaturlig sakte i skogen
Creepy
Creepy
Klumsete-ish
Assosiasjoner til dyr
Hund/hest
Edderkopp
Ligner på en hund i bevegelsene- hodet på siden kroppen 'logrer'
Litt lama-aktig?
Også en dressurhest
Hest
Som en katt/hund
Myk/Yoga/ Hundestrekk
Krymper som et insekt
Hundeaktig - men hakkete bevegelser
Ikke "ansikt"- selv biler har
Positive assosiasjoner
Morsom
Søt
Tullete
Bevegelig
Kult laget
Søt (hodet på skakke)
Spot er så kul
Imponerende

Klipp 2


Autonomi
Ble styrt/kommandert
Fjernstyrt
Mindre autonomi når man ser personen med kontrolleren
Begrenset
Fjernstyrt
Bevegelse
Veldig mekanisk når den faller og resetter seg – lirker inn bene og reiser seg
Rask
Kryper
Unaturlig, raske bevegelser
Nasty bevegelser
Litt mekaniske bevegelser
Som en litt dårlig animert film
Kult
En god skummel start
Handling
Repetetiv
Repeterende
Dressur/ trening
Spørsmål
Kan den gå i en eller flere retninger?
Reset ved fall?
Endret opplevelse
Første klipp = smart, nå = dum (klipp 2)
Funksjon
Dårlig støtte/balanse ved raske/skarpe svingninger
Dårlig støtte/balanse i nedoverbakke på sidene
Kommentarer
Kræsjet i mann
Mer fall enn i forige
Spot = hundenavn
Beskrivelser av Spot
Dramatisk
Sjangler, litt full?
Litt dum
Ser litt (mer enn i video 1) taysete ut når den går rundt på det lille området
Fortsatt creepy
Agressiv
Klums
Klønete
Dum
Morsom når den faller
Fremdeles creepy
Klumsete
Klønete
Dum
Litt sjarmerende (stakarslig, synd på den)
Stusselig
Assosiasjoner
Ser ut som en hund som leter etter et sted å basje
Ser ut som en hund som ser etter en do-plass
Greia på toppen foran ser ut litt som et hode
En valp som ikke helt klarer å gå
Leter etter noe
Litt som en flue
Insektaktig i beina
Størrelse
Var så stor som jeg trodde
Den var større enn jeg først trodde
Stor
Større enn tenkt - mer buksområder
Større enn jeg trodde

Klipp 3


Reaksjon
Slem mann som dytter Spot
Fæl
Slemt å dytte
Synd på Spot
Stakkars Spot
Synes litt synd på han = stakkarslig
Flink som klarer å reise seg opp igjen
Kommentar
Ikke farlig i seg selv, men det er heller ikke en pistol
Hadde vært vanskelig å sparke
Imponerende teknologi
Tålte fall og eventuelt en kvist
Kan utmanøvreres
Dytte = test
Trodde den ville reise seg raskere
Gjør så godt den kan
Fortsatt veldig død når død
Funksjon
Den reagerer ikke på at den er dyttet ned
Klarer alltid å reise seg
Ingen forsvarsre aksjoner
Ikke så god sidelengs i bakker
Ikke så god balanse sidelengs
Form
Robust
Tung
Treig
Robust
Beina er mer fleksible enn tenkt
Beskrivelser
"ung"
Dum
Sårbar --> creepy
Litt for stor
creepy
Dramatisk
Cry baby
Spille død
Ser ut som et dyr som spiller død når den faller
Skrekkfilm-monster
Assosiasjon
Gresshoppe
Gresshoppe
Gresshoppe/ larve

APPENDIX IV: TRANSLATIONS OF QUOTATION

Norwegian	English
...har et fast kjøremønster hvor roboten starter i ytterkantene av rommet og så kjører den i sikksakk	…having a fixed driving pattern where the robot starts with the outer edges of the room and then drives in a zigzag pattern
...assa den ville jo ikke hjem den driten	It did not want to return home that bastard
Og nå husker jeg ikke helt mønsteret, men den går liksom alltid rundt rommet, og så sikk-sakk eller sånn s-form den ene veien, også går den i s-form den andre veien.	And now I don't quite remember the pattern, but it always sort of goes around the room, and then zig-zag or s-shape one way, and then it goes in a s-shape the other way
Å gå der, det var lissom, jeg ville normalt syns det var ganske deilig å komme til en øde øy. Lissom som det ikke var noen folk på kjenne på friheten av å være alene på øya. Men så var det lissom 30 klippere rundt på plenene som summet og gikk. Det ga en sånn tilstedeværelse som var veldig annerledes. I forhold til at det ikke var noen der.	Normally, I would have liked to arrive at a deserted island, without people and feel the freedom of being alone there. But, there were like thirty lawnmowers on lawns that 'buzzed' and drove around. It created this presence that felt different in regards to the fact that there was no one there.
Eller et lys som slår seg av og på, det er jo også noe av samme greia, men med disse robotene så er det de klipperne, så er det for meg en veldig annerledes og litt merkelig opplevelse.	Or a light that switches on and off, that's also kind of the same thing, but with these robots it, so it is those "cutters", so to me it is a very different and a bit peculiar experience.
-Har aldri tenkt på den som noe annet enn det den egentlig er -Som er? -En robotstøvsuger. En halvdum robot. Ingen superAI som forstår komplisert matematikk. Den er en nyttig medhjelper som gjør hverdagen litt enklere.	-Never really thought about it as anything other than what it is -Which is? -A robot vacuum cleaner. A semi-stupid robot. No super AI that understands complicated mathematics. It is useful as a helper that makes daily life easier.

Vil du delta i forskningsprosjektet

"Case-studie om opplevelse av samspill med roboter over tid"?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke menneskers opplevelse av roboter. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål:

Vi ønsker gjennom vår masteroppgave å undersøke hvordan mennesker oppfatter og opplever roboter. Vi ble fascinert av at roboter kan oppfattes som å ha dyre- eller menneskelignende egenskaper. I noen kontekster ser vi for oss at det kan oppstå uforutsette konsekvenser, noe vi vil utforske nærmere. Blant annet er vi interessert i å utforske når roboter bør eller skal oppfattes som et verktøy eller kompanjong, og om hvorvidt dette kontekstavhengig. Kanskje kan en bedre forståelse av mekanismer som påvirker hvordan mennesker oppfatter roboter besvare dette. I tillegg lurer vi på hvordan oppfattelse av roboter eventuelt kan påvirke samarbeidet.

Vårt forskningsspørsmål er: *Hvordan oppleves samspill med en robot i bevegelse over tid?*

For å svare på forskningsspørsmålet ønsker vi imidlertid å utforske disse delspørsmålene:

1. Hvordan tolker og beskriver folk en robots bevegelse over tid?

2. Hva er informantenes tanker/refleksjoner/oppfatning rundt egen opplevelse av interaksjon med roboten

3. Hva kan designere og utviklere gjøre for å påvirke eller påvirke opplevelsen?

Forskningen vil foregå i perioden august 2021 til mai 2022.

Hvem er ansvarlig for forskningsprosjektet?

Institutt for informatikk ved Universitetet i Oslo er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Vi vil gjerne få ulike perspektiver på bruk av roboter. Du blir bedt om å delta ettersom du har robotstøvsuger og/eller robotgressklipper. Vi har ingen tydelig avgrenser populasjon, i stedet vil vi inkludere så mange perspektiver som mulig fra personer som ønsker å bidra.

Hva innebærer det for deg å delta?

Dersom du velger å delta i prosjektet, innebærer det å fylle ut en dagbok over tre (3) uker og delta på minst ett intervju med varighet på cirka en (1) time. Dagboken inneholder spørsmål om din opplevelse og tolkning av robotens bevegelser. Vi ønsker svar hver gang du bruker roboten, minimum én gang i uka. Du velger selv om du ønsker å svare skriftlig som notater på egen mobiltelefon eller i utkast på epost, eller ta opp egne refleksjoner med båndopptaker. Innleggene i dagboken sendes på epost til Runa (rmjacobs@ifi.uio.no) senest en uke etter dagbokstudiens slutt. Dette blir utgangspunkt for intervjuet. Vi ønsker å ta opp lyd under intervjuet.

I tillegg kan det være aktuelt å gjennomføre en workshop hvor vi ønsker diskusjon videre utvikling og bruk av roboter. Det er ikke nødvendig å delta på alt om man ikke ønsker det. Her vil det ikke bli tatt opptak, kun notater og eventuelt bilder.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. I arbeid med prosjektet vil kun vi, Runa Jacobsen og Tora Jarsve, samt vår hovedveileder, Rebekka Soma, og medveileder, Tønnes Nygaard, ha tilgang til dine opplysninger.

Navnet og kontaktopplysningene dine vil vi erstatte med en kode som lagres på egen navneliste adskilt fra øvrige data. All informasjon vil bli lagret på Universitetet i Oslos egen server, for å sikre forsvarlig lagring.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene anonymiseres når prosjektet avsluttes/oppgaven er godkjent, noe som etter planen er mai 2022. Alle personopplysninger, opptak og notater vil bli slettet senest august 2022.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra Universitetet i Oslo har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:

- Runa Jacobsen, rmjacobs@ifi.uio.no, ved Universitetet i Oslo
- Tora Jarsve, toraja@ifi.uio.no, ved Universitetet i Oslo
- Vår veileder: Rebekka Soma, rebsaurus@ifi.uio.no, ved Universitetet i Oslo

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

- NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 55 58 21 17.

Med vennlig hilsen

Rebekka Soma *Runa Jacobsen* *Tora Jarsve*

(Forsker/veileder)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *Case-studie om opplevelse av samspill med roboter over tid*, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- å delta i dagbokstudie
- å delta i intervju
- å delta i workshop
- å ta lydopptak
- å bli tatt bilde av (anonymisert, hvor ansikt ikke vil synes)

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)

APPENDIX VI: APPROVAL FROM NSD

18.06.2021 - Vurdert

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 18.06.2021.

Behandlingen kan starte.

DEL PROSJEKTET MED PROSJEKTANSVARLIG

Det er obligatorisk for studenter å dele meldeskjemaet med prosjektansvarlig (veileder). Det gjøres ved å trykke på "Del prosjekt" i meldeskjemaet. Om prosjektansvarlig ikke svarer på invitasjonen innen en uke må han/hun inviteres på nytt.

TYPE OPPLYSNINGER OG VARIGHET

Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 15.09.2022.

LOVLIG GRUNNLAG

Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER

NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om: lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke viderebehandles til nye uforenlige formål dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER

NSD vurderer at informasjonen om behandlingen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13. Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18) og dataportabilitet (art. 20). Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER

NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32). For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og eventuelt rådføre dere med behandlingsansvarlig institusjon.

MELD VESENTLIGE ENDRINGER

Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde: https://www.nsd.no/personverntjenester/fylle-ut-meldeskjema-for-personopplysninger/melde-endringer-i-meldeskjema

Du må vente på svar fra NSD før endringen gjennomføres.

OPPFØLGING AV PROSJEKTET

NSD vil følge opp underveis (hvert annet år) og ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet/pågår i tråd med den behandlingen som er dokumentert.

Kontaktperson hos NSD: Elizabeth Blomstervik

End of thesis